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SEQUENCE LISTING

<110> Matsuda, Seiichi P.T.
Schepmann, Hala G

<120> Ginkgo Biloba Levopimaradiene Synthase

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<141> 2002-01-07

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Gln Lys Ile Pro Leu Asn Val Leu His Asn His Gln Thr Ala Leu Leu
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Tyr Ser Leu Glu Gly Leu Gln Asp Val Val Asp Trp Gln Glu Ile Thr
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Leu Arg Lys Val Trp Glu Gly Leu Leu Ala Ser Tyr Thr Lys Glu Ala
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Leu Arg Ser Lys Phe Leu His Leu Val Ser Leu Thr Gly Arg Leu Ile
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770 775 780

Ser Ser Val Gln Cys Tyr Met Arg Glu Asn Pro Glu Cys Thr Glu Glu
785 790 795 800

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Cys Tyr Met Lys Asp His Pro Lys Ile Ser Glu Glu Glu Ala Leu Gln
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His Val Tyr Ser Val Met Glu Asn Ala Leu Glu Glu Leu Asn Arg Glu
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gcggggacct atgaacccca gtatgccaaa tgcaggttcc tctttacaaa agtggcatgc 1680

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gaacaggggc gtgaattggt cagcttttc agaaagggat gggaggatta tcttctgggt 1920

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aagaatggaa tcacatctat cggccaacgt atacttctgt tgagtggagt gttgataatg 2040

gatgggcaac tcctttcgca agaggcatta gagaaagtag attatccagg aagacgtgtt 2100

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gaggagacaa gagtgacgat ggtgatattc aaggatggag atggattcgg tgtttccaaa 2400

ttagaagtca aagatcatat caaagagtgt ctcattgaac cgctgccact gtaatcaaaa 2460

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aaaaaaaa 2528

<210> 14
<211> 2424
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<213> Abies grandis

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agaatcaatg attactccat ctgcttatga cacagcatgg gtagcgaggg tgcccgccat 180

tgatggctct gctcgcccgc aatttcccca aacagttgac tggattttga aaaaccagtt 240

aaaagatggt tcatggggaa ttcagtccca ctttctgctg tccgaccgtc ttcttgccac 300

tctttcttgt gttcttgtgc tccttaaatg gaacgttggg gatctgcaag tagagcaggg 360

aattgaattc ataaagagca atctggaact agtaaaggat gaaaccgatc aagatagctt 420

ggtaacagac tttgagatca tatttccttc tctgttaaga gaagctcaat ctctgcgcct 480

cggacttccc tacgacctgc cttatataca tctgttgcag actaaacggc aggaaagatt 540

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ccttgaattc ttgaacagtg tgatgatcaa gtttggaaat tttgttccct gcctgtatcc 780

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aggaattggg tggggcagac taaatcccat agcagatctt gagaccactg ctttgggatt 960

tcgattgctt cggctgcata ggtacaatgt atctccagcc atttttgaca acttcaaaga 1020

tgccaatggg aaattcattt gctcgaccgg tcaattcaac aaagatgtag caagcatgct 1080

gaatctttat agagcttccc agctcgcatt tcccggagaa aacattcttg atgaagctaa 1140

aagcttcgct actaaatatt tgagagaagc tcttgagaaa agtgagactt ccagtgcatg 1200

gaacaacaaa caaaacctga gccaagagat caaatacgcg ctgaagactt cttggcatgc 1260

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aaaattagat ttcaacatta tccagtccat ccaccaagaa gaaatgaaga atgttaccag 1440

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gccactgtaa tcaaaatagt tgcaataata attgaaataa tgtcaactat gtttcacaaa 2400

aaaaaaaaaa aaaaaaaaaa aaaa 2424

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<211> 817
<212> PRT
<213> Abies grandis

<400> 15

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Leu Ser Ser Thr Ser Gly Leu Ile Arg Arg Thr Ala Asn Pro His Pro
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Asn Val Trp Gly Tyr Asp Leu Val His Ser Leu Lys Ser Pro Tyr Ile
35 40 45

Asp Ser Ser Tyr Arg Glu Arg Ala Glu Val Leu Val Ser Glu Ile Lys
50 55 60

Ala Met Leu Asn Pro Ala Ile Thr Gly Asp Gly Glu Ser Met Ile Thr
65 70 75 80

Pro Ser Ala Tyr Asp Thr Ala Trp Val Ala Arg Val Pro Ala Ile Asp
85 90 95

Gly Ser Ala Arg Pro Gln Phe Pro Gln Thr Val Asp Trp Ile Leu Lys
100 105 110

Asn Gln Leu Lys Asp Gly Ser Trp Gly Ile Gln Ser His Phe Leu Leu
115 120 125

Ser Asp Arg Leu Leu Ala Thr Leu Ser Cys Val Leu Val Leu Leu Lys
130 135 140

Trp Asn Val Gly Asp Leu Gln Val Glu Gln Gly Ile Glu Phe Ile Lys
145 150 155 160

Ser Asn Leu Glu Leu Val Lys Asp Glu Thr Asp Gln Asp Ser Leu Val
165 170 175

Thr Asp Phe Glu Ile Ile Phe Pro Ser Leu Leu Arg Glu Ala Gln Ser
180 185 190

Leu Arg Leu Gly Leu Pro Tyr Asp Leu Pro Tyr Ile His Leu Leu Gln
195 200 205

Thr Lys Arg Gln Glu Arg Leu Ala Lys Leu Ser Arg Glu Glu Ile Tyr
210 215 220

Ala Val Pro Ser Pro Leu Leu Tyr Ser Leu Glu Gly Ile Gln Asp Ile
225 230 235 240

Val Glu Trp Glu Arg Ile Met Glu Val Gln Ser Gln Asp Gly Ser Phe
245 250 255

Leu Ser Ser Pro Ala Ser Thr Ala Cys Val Phe Met His Thr Gly Asp
260 265 270

Ala Lys Cys Leu Glu Phe Leu Asn Ser Val Met Ile Lys Phe Gly Asn
275 280 285

Phe Val Pro Cys Leu Tyr Pro Val Asp Leu Leu Glu Arg Leu Leu Ile
290 295 300

Val Asp Asn Ile Val Arg Leu Gly Ile Tyr Arg His Phe Glu Lys Glu

305 310 315 320

Ile Lys Glu Ala Leu Asp Tyr Val Tyr Arg His Trp Asn Glu Arg Gly
325 330 335

Ile Gly Trp Gly Arg Leu Asn Pro Ile Ala Asp Leu Glu Thr Thr Ala
340 345 350

Leu Gly Phe Arg Leu Leu Arg Leu His Arg Tyr Asn Val Ser Pro Ala
355 360 365

Ile Phe Asp Asn Phe Lys Asp Ala Asn Gly Lys Phe Ile Cys Ser Thr
370 375 380

Gly Gln Phe Asn Lys Asp Val Ala Ser Met Leu Asn Leu Tyr Arg Ala
385 390 395 400

Ser Gln Leu Ala Phe Pro Gly Glu Asn Ile Leu Asp Glu Ala Lys Ser
405 410 415

Phe Ala Thr Lys Tyr Leu Arg Glu Ala Leu Glu Lys Ser Glu Thr Ser
420 425 430

Ser Ala Trp Asn Asn Lys Gln Asn Leu Ser Gln Glu Ile Lys Tyr Ala
435 440 445

Leu Lys Thr Ser Trp His Ala Ser Val Pro Arg Val Glu Ala Lys Arg
450 455 460

Tyr Cys Gln Val Tyr Arg Pro Asp Tyr Ala Arg Ile Ala Lys Cys Val
465 470 475 480

Tyr Lys Leu Pro Tyr Val Asn Asn Glu Lys Phe Leu Glu Leu Gly Lys
485 490 495

Leu Asp Phe Asn Ile Ile Gln Ser Ile His Gln Glu Glu Met Lys Asn
500 505 510

Val Thr Ser Trp Phe Arg Asp Ser Gly Leu Pro Leu Phe Thr Phe Ala
515 520 525

Arg Glu Arg Pro Leu Glu Phe Tyr Phe Leu Val Ala Ala Gly Thr Tyr
530 535 540

Glu Pro Gln Tyr Ala Lys Cys Arg Phe Leu Phe Thr Lys Val Ala Cys
545 550 555 560

Leu Gln Thr Val Leu Asp Asp Met Tyr Asp Thr Tyr Gly Thr Leu Asp
565 570 575

Glu Leu Lys Leu Phe Thr Glu Ala Val Arg Arg Trp Asp Leu Ser Phe
580 585 590

Thr Glu Asn Leu Pro Asp Tyr Met Lys Leu Cys Tyr Gln Ile Tyr Tyr
595 600 605

Asp Ile Val His Glu Val Ala Trp Glu Ala Glu Lys Glu Gln Gly Arg
610 615 620

Glu Leu Val Ser Phe Phe Arg Lys Gly Trp Glu Asp Tyr Leu Leu Gly
625 630 635 640

Tyr Tyr Glu Glu Ala Glu Trp Leu Ala Ala Glu Tyr Val Pro Thr Leu
645 650 655

Asp Glu Tyr Ile Lys Asn Gly Ile Thr Ser Ile Gly Gln Arg Ile Leu
660 665 670

Leu Leu Ser Gly Val Leu Ile Met Asp Gly Gln Leu Leu Ser Gln Glu
675 680 685

Ala Leu Glu Lys Val Asp Tyr Pro Gly Arg Arg Val Leu Thr Glu Leu
690 695 700

Asn Ser Leu Ile Ser Arg Leu Ala Asp Asp Thr Lys Thr Tyr Lys Ala
705 710 715 720

Glu Lys Ala Arg Gly Glu Leu Ala Ser Ser Ile Glu Cys Tyr Met Lys
725 730 735

Asp His Pro Glu Cys Thr Glu Glu Glu Ala Leu Asp His Ile Tyr Ser
740 745 750

Ile Leu Glu Pro Ala Val Lys Glu Leu Thr Arg Glu Phe Leu Lys Pro
755 760 765

Asp Asp Val Pro Phe Ala Cys Lys Lys Met Leu Phe Glu Glu Thr Arg
770 775 780

Val Thr Met Val Ile Phe Lys Asp Gly Asp Gly Phe Gly Val Ser Lys
785 790 795 800

Leu Glu Val Lys Asp His Ile Lys Glu Cys Leu Ile Glu Pro Leu Pro
805 810 815

Leu

<210> 16
<211> 782
<212> PRT
<213> Abies grandis

<400> 16

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Asn Pro Ala Ile Thr Gly Asp Gly Glu Ser Met Ile Thr Pro Ser Ala
35 40 45

Tyr Asp Thr Ala Trp Val Ala Arg Val Pro Ala Ile Asp Gly Ser Ala
50 55 60

Arg Pro Gln Phe Pro Gln Thr Val Asp Trp Ile Leu Lys Asn Gln Leu
65 70 75 80

Lys Asp Gly Ser Trp Gly Ile Gln Ser His Phe Leu Leu Ser Asp Arg
85 90 95

Leu Leu Ala Thr Leu Ser Cys Val Leu Val Leu Leu Lys Trp Asn Val
100 105 110

Gly Asp Leu Gln Val Glu Gln Gly Ile Glu Phe Ile Lys Ser Asn Leu
115 120 125

Glu Leu Val Lys Asp Glu Thr Asp Gln Asp Ser Leu Val Thr Asp Phe
130 135 140

Glu Ile Ile Phe Pro Ser Leu Leu Arg Glu Ala Gln Ser Leu Arg Leu
145 150 155 160

Gly Leu Pro Tyr Asp Leu Pro Tyr Ile His Leu Leu Gln Thr Lys Arg
165 170 175

Gln Glu Arg Leu Ala Lys Leu Ser Arg Glu Glu Ile Tyr Ala Val Pro

180 185 190

Ser Pro Leu Leu Tyr Ser Leu Glu Gly Ile Gln Asp Ile Val Glu Trp
195 200 205

Glu Arg Ile Met Glu Val Gln Ser Gln Asp Gly Ser Phe Leu Ser Ser
210 215 220

Pro Ala Ser Thr Ala Cys Val Phe Met His Thr Gly Asp Ala Lys Cys
225 230 235 240

Leu Glu Phe Leu Asn Ser Val Met Ile Lys Phe Gly Asn Phe Val Pro
245 250 255

Cys Leu Tyr Pro Val Asp Leu Leu Glu Arg Leu Leu Ile Val Asp Asn
260 265 270

Ile Val Arg Leu Gly Ile Tyr Arg His Phe Glu Lys Glu Ile Lys Glu
275 280 285

Ala Leu Asp Tyr Val Tyr Arg His Trp Asn Glu Arg Gly Ile Gly Trp
290 295 300

Gly Arg Leu Asn Pro Ile Ala Asp Leu Glu Thr Thr Ala Leu Gly Phe
305 310 315 320

Arg Leu Leu Arg Leu His Arg Tyr Asn Val Ser Pro Ala Ile Phe Asp
325 330 335

Asn Phe Lys Asp Ala Asn Gly Lys Phe Ile Cys Ser Thr Gly Gln Phe
340 345 350

Asn Lys Asp Val Ala Ser Met Leu Asn Leu Tyr Arg Ala Ser Gln Leu
355 360 365

Ala Phe Pro Gly Glu Asn Ile Leu Asp Glu Ala Lys Ser Phe Ala Thr
370 375 380

Lys Tyr Leu Arg Glu Ala Leu Glu Lys Ser Glu Thr Ser Ser Ala Trp
385 390 395 400

Asn Asn Lys Gln Asn Leu Ser Gln Glu Ile Lys Tyr Ala Leu Lys Thr
405 410 415

Ser Trp His Ala Ser Val Pro Arg Val Glu Ala Lys Arg Tyr Cys Gln
420 425 430

Val Tyr Arg Pro Asp Tyr Ala Arg Ile Ala Lys Cys Val Tyr Lys Leu
435 440 445

Pro Tyr Val Asn Asn Glu Lys Phe Leu Glu Leu Gly Lys Leu Asp Phe
450 455 460

Asn Ile Ile Gln Ser Ile His Gln Glu Glu Met Lys Asn Val Thr Ser
465 470 475 480

Trp Phe Arg Asp Ser Gly Leu Pro Leu Phe Thr Phe Ala Arg Glu Arg
485 490 495

Pro Leu Glu Phe Tyr Phe Leu Val Ala Ala Gly Thr Tyr Glu Pro Gln
500 505 510

Tyr Ala Lys Cys Arg Phe Leu Phe Thr Lys Val Ala Cys Leu Gln Thr
515 520 525

Val Leu Asp Asp Met Tyr Asp Thr Tyr Gly Thr Leu Asp Glu Leu Lys
530 535 540

Leu Phe Thr Glu Ala Val Arg Arg Trp Asp Leu Ser Phe Thr Glu Asn
545 550 555 560

Leu Pro Asp Tyr Met Lys Leu Cys Tyr Gln Ile Tyr Tyr Asp Ile Val
565 570 575

His Glu Val Ala Trp Glu Ala Glu Lys Glu Gln Gly Arg Glu Leu Val
580 585 590

Ser Phe Phe Arg Lys Gly Trp Glu Asp Tyr Leu Leu Gly Tyr Tyr Glu
595 600 605

Glu Ala Glu Trp Leu Ala Ala Glu Tyr Val Pro Thr Leu Asp Glu Tyr
610 615 620

Ile Lys Asn Gly Ile Thr Ser Ile Gly Gln Arg Ile Leu Leu Leu Ser
625 630 635 640

Gly Val Leu Ile Met Asp Gly Gln Leu Leu Ser Gln Glu Ala Leu Glu
645 650 655

Lys Val Asp Tyr Pro Gly Arg Arg Val Leu Thr Glu Leu Asn Ser Leu
660 665 670

Ile Ser Arg Leu Ala Asp Asp Thr Lys Thr Tyr Lys Ala Glu Lys Ala
675 680 685

Arg Gly Glu Leu Ala Ser Ser Ile Glu Cys Tyr Met Lys Asp His Pro
690 695 700

Glu Cys Thr Glu Glu Glu Ala Leu Asp His Ile Tyr Ser Ile Leu Glu
705 710 715 720

Pro Ala Val Lys Glu Leu Thr Arg Glu Phe Leu Lys Pro Asp Asp Val
725 730 735

Pro Phe Ala Cys Lys Lys Met Leu Phe Glu Glu Thr Arg Val Thr Met
740 745 750

Val Ile Phe Lys Asp Gly Asp Gly Phe Gly Val Ser Lys Leu Glu Val
755 760 765

Lys Asp His Ile Lys Glu Cys Leu Ile Glu Pro Leu Pro Leu
770 775 780

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<211> 1865
<212> DNA
<213> Abies grandis

<400> 17
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gatggcgatc atgatttaat caaacgtctt cagatcgttg acactttgga atgcctggga 240

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tggaacgaaa aaggtatcgg ggagggatca agagattcct tcagcaaaga tctgaacgct 360

acggctttag gatttcgcgc tctccgactg catcgatata acgtatcgtc aggtgtgttg 420

aagaatttca aggatgaaaa cgggaagttc ttctgcaact ttactggtga agaaggaaga 480

ggagataaac aagtgagaag catgttgtcg ttacttcgag cttcagagat ttcgtttccc 540

ggagaaaaag tgatggaaga ggccaaggca ttcacaagag aatatctaaa ccaagtttta 600

gctggacacg gggatgtgac tgacgtggat caaagccttt tgagagaggt gaagtacgca 660

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tatggacaca accattcgtg gctcaagtcg aatatcaacc aaaaaatgtt gaagttagcc 780

aaattggact tcaatattct gcaatgcaaa catcacaagg agatacagtt tattacaagg 840

tggtggagag actcgggtat atcgcagctg aatttctatc gaaagcgaca cgtggaatat 900

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gccaaaactg ctatcctgtg tactgttcta gatgacctct atgatacgca cgcaacattg 1020

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cctgaatcta cagtggaaaa tgctttaaat cacataaaag gcatccttaa tcgttccctt 1560

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tcgag 1865

<210> 18
<211> 581
<212> PRT
<213> Abies grandis

<400> 18

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His Gly Asn Val Trp Asp Asp Asp Leu Ile His Ser Leu Asn Ser Pro
20 25 30

Tyr Gly Ala Pro Ala Tyr Tyr Glu Leu Leu Gln Lys Leu Ile Gln Glu
35 40 45

Ile Lys His Leu Leu Leu Thr Glu Met Glu Met Asp Asp Gly Asp His
50 55 60

Asp Leu Ile Lys Arg Leu Gln Ile Val Asp Thr Leu Glu Cys Leu Gly
65 70 75 80

Ile Asp Arg His Phe Glu His Glu Ile Gln Thr Ala Ala Leu Asp Tyr
85 90 95

Val Tyr Arg Trp Trp Asn Glu Lys Gly Ile Gly Glu Gly Ser Arg Asp
100 105 110

Ser Phe Ser Lys Asp Leu Asn Ala Thr Ala Leu Gly Phe Arg Ala Leu
115 120 125

Arg Leu His Arg Tyr Asn Val Ser Ser Gly Val Leu Lys Asn Phe Lys
130 135 140

Asp Glu Asn Gly Lys Phe Phe Cys Asn Phe Thr Gly Glu Glu Gly Arg
145 150 155 160

Gly Asp Lys Gln Val Arg Ser Met Leu Ser Leu Leu Arg Ala Ser Glu
165 170 175

Ile Ser Phe Pro Gly Glu Lys Val Met Glu Glu Ala Lys Ala Phe Thr
180 185 190

Arg Glu Tyr Leu Asn Gln Val Leu Ala Gly His Gly Asp Val Thr Asp
195 200 205

Val Asp Gln Ser Leu Leu Arg Glu Val Lys Tyr Ala Leu Glu Phe Pro
210 215 220

Trp His Cys Ser Val Pro Arg Trp Glu Ala Arg Ser Phe Leu Glu Ile
225 230 235 240

Tyr Gly His Asn His Ser Trp Leu Lys Ser Asn Ile Asn Gln Lys Met
245 250 255

Leu Lys Leu Ala Lys Leu Asp Phe Asn Ile Leu Gln Cys Lys His His
260 265 270

Lys Glu Ile Gln Phe Ile Thr Arg Trp Trp Arg Asp Ser Gly Ile Ser
275 280 285

Gln Leu Asn Phe Tyr Arg Lys Arg His Val Glu Tyr Tyr Ser Trp Val
290 295 300

Val Met Cys Ile Phe Glu Pro Glu Phe Ser Glu Ser Arg Ile Ala Phe
305 310 315 320

Ala Lys Thr Ala Ile Leu Cys Thr Val Leu Asp Asp Leu Tyr Asp Thr
325 330 335

His Ala Thr Leu His Glu Ile Lys Ile Met Thr Glu Gly Val Arg Arg
340 345 350

Trp Asp Leu Ser Leu Thr Asp Asp Leu Pro Asp Tyr Ile Lys Ile Ala
355 360 365

Phe Gln Phe Phe Phe Asn Thr Val Asn Glu Leu Ile Val Glu Ile Val
370 375 380

Lys Arg Gln Gly Arg Asp Met Thr Thr Ile Val Lys Asp Cys Trp Lys
385 390 395 400

Arg Tyr Ile Glu Ser Tyr Leu Gln Glu Ala Glu Trp Ile Ala Thr Gly
405 410 415

His Ile Pro Thr Phe Asn Glu Tyr Ile Lys Asn Gly Met Ala Ser Ser
420 425 430

Gly Met Cys Ile Leu Asn Leu Asn Pro Leu Leu Leu Leu Asp Lys Leu
435 440 445

Leu Pro Asp Asn Ile Leu Glu Gln Ile His Ser Pro Ser Lys Ile Leu
450 455 460

Asp Leu Leu Glu Leu Thr Gly Arg Ile Ala Asp Asp Leu Lys Asp Phe
465 470 475 480

Glu Asp Glu Lys Glu Arg Gly Glu Met Ala Ser Ser Leu Gln Cys Tyr
485 490 495

Met Lys Glu Asn Pro Glu Ser Thr Val Glu Asn Ala Leu Asn His Ile
500 505 510

Lys Gly Ile Leu Asn Arg Ser Leu Glu Glu Phe Asn Trp Glu Phe Met
515 520 525

Lys Gln Asp Ser Val Pro Met Cys Cys Lys Lys Phe Thr Phe Asn Ile
530 535 540

Gly Arg Gly Leu Gln Phe Ile Tyr Lys Tyr Arg Asp Gly Leu Tyr Ile

545 550 555 560

Ser Asp Lys Glu Val Lys Asp Gln Ile Phe Lys Ile Leu Val His Gln
565 570 575

Val Pro Met Glu Glu
580

<210> 19
<211> 1785
<212> DNA
<213> Abies grandis

<400> 19
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gaggcgaagg cattcacaac aaattatcta aagaaagttt tagcaggacg ggaggctacc 660

cacgtcgatg aaagcctttt gggagaggtg aagtacgcat tggagtttcc atggcattgc 720

agtgtgcaga gatgggaggc aaggagcttt atcgaaatat ttggacaaat tgattcagag 780

cttaagtcga atttgagcaa aaaaatgtta gagttggcga aattggactt caatattctg 840

caatgcacac atcagaaaga actgcagatt atctcaaggt ggttcgcaga ctcaagtata 900

gcatccctga atttctatcg gaaatgttac gtcgaatttt acttttggat ggctgcagcc 960

atctccgagc cggagttttc tggaagcaga gttgccttca caaaaattgc tatactgatg 1020

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ctgcaagatg cggaatggat agccactgga catgtcccca cctttgatga gtacttgaat 1320

aatggcacac caaacactgg gatgtgtgta ttgaatttga ttccgcttct gttaatgggt 1380

gaacatttac caatcgacat tctggagcaa atattcttgc cctccaggtt ccaccatctc 1440

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ggggatttat cgtgtattga gtgttattta aaagatcatc ctgagtctac agtagaagat 1560

gctttaaatc atgttaatgg cctccttggc aattgccttc tggaaatgaa ttggaagttc 1620

ttaaagaagc aggacagtgt gccactctcg tgtaagaagt acagcttcca tgtattggca 1680

cgaagcatcc aattcatgta caatcaaggc gatggcttct ccatttcgaa caaagtgatc 1740

aaggatcaag tgcagaaagt tcttattgtc cccgtgccta tttga 1785

<210> 20
<211> 593
<212> PRT
<213> Abies grandis

<400> 20

Met Ala Gln Ile Ser Glu Ser Val Ser Pro Ser Thr Asp Leu Lys Ser
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Thr Glu Ser Ser Ile Thr Ser Asn Arg His Gly Asn Met Trp Glu Asp
20 25 30

Asp Arg Ile Gln Ser Leu Asn Ser Pro Tyr Gly Ala Pro Ala Tyr Gln
35 40 45

Glu Arg Ser Glu Lys Leu Ile Glu Glu Ile Lys Leu Leu Phe Leu Ser
50 55 60

Asp Met Asp Asp Ser Cys Asn Asp Ser Asp Arg Asp Leu Ile Lys Arg
65 70 75 80

Leu Glu Ile Val Asp Thr Val Glu Cys Leu Gly Ile Asp Arg His Phe
85 90 95

Gln Pro Glu Ile Lys Leu Ala Leu Asp Tyr Val Tyr Arg Cys Trp Asn
100 105 110

Glu Arg Gly Ile Gly Glu Gly Ser Arg Asp Ser Leu Lys Lys Asp Leu
115 120 125

Asn Ala Thr Ala Leu Gly Phe Arg Ala Leu Arg Leu His Arg Tyr Asn
130 135 140

Val Ser Ser Gly Val Leu Glu Asn Phe Arg Asp Asp Asn Gly Gln Phe

145 150 155 160

Phe Cys Gly Ser Thr Val Glu Glu Glu Gly Ala Glu Ala Tyr Asn Lys
165 170 175

His Val Arg Cys Met Leu Ser Leu Ser Arg Ala Ser Asn Ile Leu Phe
180 185 190

Pro Gly Glu Lys Val Met Glu Glu Ala Lys Ala Phe Thr Thr Asn Tyr
195 200 205

Leu Lys Lys Val Leu Ala Gly Arg Glu Ala Thr His Val Asp Glu Ser
210 215 220

Leu Leu Gly Glu Val Lys Tyr Ala Leu Glu Phe Pro Trp His Cys Ser
225 230 235 240

Val Gln Arg Trp Glu Ala Arg Ser Phe Ile Glu Ile Phe Gly Gln Ile
245 250 255

Asp Ser Glu Leu Lys Ser Asn Leu Ser Lys Lys Met Leu Glu Leu Ala
260 265 270

Lys Leu Asp Phe Asn Ile Leu Gln Cys Thr His Gln Lys Glu Leu Gln
275 280 285

Ile Ile Ser Arg Trp Phe Ala Asp Ser Ser Ile Ala Ser Leu Asn Phe
290 295 300

Tyr Arg Lys Cys Tyr Val Glu Phe Tyr Phe Trp Met Ala Ala Ala Ile
305 310 315 320

Ser Glu Pro Glu Phe Ser Gly Ser Arg Val Ala Phe Thr Lys Ile Ala
325 330 335

Ile Leu Met Thr Met Leu Asp Asp Leu Tyr Asp Thr His Gly Thr Leu
340 345 350

Asp Gln Leu Lys Ile Phe Thr Glu Gly Val Arg Arg Trp Asp Val Ser
355 360 365

Leu Val Glu Gly Leu Pro Asp Phe Met Lys Ile Ala Phe Glu Phe Trp
370 375 380

Leu Lys Thr Ser Asn Glu Leu Ile Ala Glu Ala Val Lys Ala Gln Gly
385 390 395 400

Gln Asp Met Ala Ala Tyr Ile Arg Lys Asn Ala Trp Glu Arg Tyr Leu
405 410 415

Glu Ala Tyr Leu Gln Asp Ala Glu Trp Ile Ala Thr Gly His Val Pro
420 425 430

Thr Phe Asp Glu Tyr Leu Asn Asn Gly Thr Pro Asn Thr Gly Met Cys
435 440 445

Val Leu Asn Leu Ile Pro Leu Leu Leu Met Gly Glu His Leu Pro Ile
450 455 460

Asp Ile Leu Glu Gln Ile Phe Leu Pro Ser Arg Phe His His Leu Ile
465 470 475 480

Glu Leu Ala Ser Arg Leu Val Asp Asp Ala Arg Asp Phe Gln Ala Glu
485 490 495

Lys Asp His Gly Asp Leu Ser Cys Ile Glu Cys Tyr Leu Lys Asp His
500 505 510

Pro Glu Ser Thr Val Glu Asp Ala Leu Asn His Val Asn Gly Leu Leu
515 520 525

Gly Asn Cys Leu Leu Glu Met Asn Trp Lys Phe Leu Lys Lys Gln Asp
530 535 540

Ser Val Pro Leu Ser Cys Lys Lys Tyr Ser Phe His Val Leu Ala Arg
545 550 555 560

Ser Ile Gln Phe Met Tyr Asn Gln Gly Asp Gly Phe Ser Ile Ser Asn
565 570 575

Lys Val Ile Lys Asp Gln Val Gln Lys Val Leu Ile Val Pro Val Pro
580 585 590

Ile

<210> 21
<211> 2018
<212> DNA
<213> Abies grandis

<400> 21
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tgatcagttc tacccatgag cttaaggctc tctctagaac aattccagct ctaggaatga 120

gtaggcgagg gaaatctatc actccttcca tcagcatgag ctctaccacc gttgtaaccg 180

atgatggtgt acgaagacgc atgggcgatt tccattccaa cctctgggac gatgatgtca 240

tacagtcttt accaacggct tatgaggaaa aatcgtacct ggagcgtgct gagaaactga 300

tcggggaagt aaagaacatg ttcaattcga tgtcattaga agatggagag ttaatgagtc 360

cgctcaatga tctcattcaa cgcctttgga ttgtcgacag ccttgaacgt ttggggatcc 420

atagacattt caaagatgag ataaaatcgg cgcttgatta tgtttacagt tattggggcg 480

aaaatggcat cggatgcggg agggagagtg ttgttactga tctgaactca actgcgttgg 540

ggcttcgaac cctacgacta cacggatacc cggtgtcttc agatgttttc aaagctttca 600

aaggccaaaa tgggcagttt tcctgctctg aaaatattca gacagatgaa gagatcagag 660

gcgttctgaa tttattccgg gcctccctca ttgcctttcc aggggagaaa attatggatg 720

aggctgaaat cttctctacc aaatatttaa aagaagccct gcaaaagatt ccggtctcca 780

gtctttcgcg agagatcggg gacgttttgg aatatggttg gcacacatat ttgccgcgat 840

tggaagcaag gaattacatc caagtctttg gacaggacac tgagaacacg aagtcatatg 900

tgaagagcaa aaaactttta gaactcgcaa aattggagtt caacatcttt caatccttac 960

aaaagaggga gttagaaagt ctggtcagat ggtggaaaga atcgggtttt cctgagatga 1020

ccttctgccg acatcgtcac gtggaatact acactttggc ttcctgcatt gcgttcgagc 1080

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ggtggatcgc cactggttac ctgccctcct ttgatgagta ctacgagaat gggaaagtta 1440

gctgtggtca tcgcatatcc gcattgcaac ccattctgac aatggacatc ccctttcctg 1500

atcatatcct caaggaagtt gacttcccat caaagcttaa cgacttggca tgtgccatcc 1560

ttcgattacg aggtgatacg cggtgctaca aggcggacag ggctcgtgga gaagaagctt 1620

cctctatatc atgttatatg aaagacaatc ctggagtatc agaggaagat gctctcgatc 1680

atatcaacgc catgatcagt gacgtaatca aaggattaaa ttgggaactt ctcaaaccag 1740

acatcaatgt tcccatctcg gcgaagaaac atgcttttga catcgccaga gctttccatt 1800

acggctacaa ataccgagac ggctacagcg ttgccaacgt tgaaacgaag agtttggtca 1860

cgagaaccct ccttgaatct gtgcctttgt agcaacagct caaatctatg ccctatgcta 1920

tgtcgggtta aaatatatgt ggaaggtagc cgttggatgt agaggataag tttgttataa 1980

tttaataaag ttgtaattta aaaaaaaaaa aaaaaaaa 2018

<210> 22
<211> 628
<212> PRT
<213> Abies grandis

<400> 22

Met Ala Leu Val Ser Thr Ala Pro Leu Ala Ser Lys Ser Cys Leu His
1 5 10 15

Lys Ser Leu Ile Ser Ser Thr His Glu Leu Lys Ala Leu Ser Arg Thr
20 25 30

Ile Pro Ala Leu Gly Met Ser Arg Arg Gly Lys Ser Ile Thr Pro Ser
35 40 45

Ile Ser Met Ser Ser Thr Thr Val Val Thr Asp Asp Gly Val Arg Arg
50 55 60

Arg Met Gly Asp Phe His Ser Asn Leu Trp Asp Asp Asp Val Ile Gln
65 70 75 80

Ser Leu Pro Thr Ala Tyr Glu Glu Lys Ser Tyr Leu Glu Arg Ala Glu
85 90 95

Lys Leu Ile Gly Glu Val Lys Asn Met Phe Asn Ser Met Ser Leu Glu
100 105 110

Asp Gly Glu Leu Met Ser Pro Leu Asn Asp Leu Ile Gln Arg Leu Trp
115 120 125

Ile Val Asp Ser Leu Glu Arg Leu Gly Ile His Arg His Phe Lys Asp
130 135 140

Glu Ile Lys Ser Ala Leu Asp Tyr Val Tyr Ser Tyr Trp Gly Glu Asn
145 150 155 160

Gly Ile Gly Cys Gly Arg Glu Ser Val Val Thr Asp Leu Asn Ser Thr
165 170 175

Ala Leu Gly Leu Arg Thr Leu Arg Leu His Gly Tyr Pro Val Ser Ser
180 185 190

Asp Val Phe Lys Ala Phe Lys Gly Gln Asn Gly Gln Phe Ser Cys Ser
195 200 205

Glu Asn Ile Gln Thr Asp Glu Glu Ile Arg Gly Val Leu Asn Leu Phe
210 215 220

Arg Ala Ser Leu Ile Ala Phe Pro Gly Glu Lys Ile Met Asp Glu Ala
225 230 235 240

Glu Ile Phe Ser Thr Lys Tyr Leu Lys Glu Ala Leu Gln Lys Ile Pro
245 250 255

Val Ser Ser Leu Ser Arg Glu Ile Gly Asp Val Leu Glu Tyr Gly Trp
260 265 270

His Thr Tyr Leu Pro Arg Leu Glu Ala Arg Asn Tyr Ile Gln Val Phe
275 280 285

Gly Gln Asp Thr Glu Asn Thr Lys Ser Tyr Val Lys Ser Lys Lys Leu
290 295 300

Leu Glu Leu Ala Lys Leu Glu Phe Asn Ile Phe Gln Ser Leu Gln Lys
305 310 315 320

Arg Glu Leu Glu Ser Leu Val Arg Trp Trp Lys Glu Ser Gly Phe Pro
325 330 335

Glu Met Thr Phe Cys Arg His Arg His Val Glu Tyr Tyr Thr Leu Ala
340 345 350

Ser Cys Ile Ala Phe Glu Pro Gln His Ser Gly Phe Arg Leu Gly Phe
355 360 365

Ala Lys Thr Cys His Leu Ile Thr Val Leu Asp Asp Met Tyr Asp Thr
370 375 380

Phe Gly Thr Val Asp Glu Leu Glu Leu Phe Thr Ala Thr Met Lys Arg
385 390 395 400

Trp Asp Pro Ser Ser Ile Asp Cys Leu Pro Glu Tyr Met Lys Gly Val
405 410 415

Tyr Ile Ala Val Tyr Asp Thr Val Asn Glu Met Ala Arg Glu Ala Glu
420 425 430

Glu Ala Gln Gly Arg Asp Thr Leu Thr Tyr Ala Arg Glu Ala Trp Glu
435 440 445

Ala Tyr Ile Asp Ser Tyr Met Gln Glu Ala Arg Trp Ile Ala Thr Gly
450 455 460

Tyr Leu Pro Ser Phe Asp Glu Tyr Tyr Glu Asn Gly Lys Val Ser Cys
465 470 475 480

Gly His Arg Ile Ser Ala Leu Gln Pro Ile Leu Thr Met Asp Ile Pro
485 490 495

Phe Pro Asp His Ile Leu Lys Glu Val Asp Phe Pro Ser Lys Leu Asn
500 505 510

Asp Leu Ala Cys Ala Ile Leu Arg Leu Arg Gly Asp Thr Arg Cys Tyr
515 520 525

Lys Ala Asp Arg Ala Arg Gly Glu Glu Ala Ser Ser Ile Ser Cys Tyr
530 535 540

Met Lys Asp Asn Pro Gly Val Ser Glu Glu Asp Ala Leu Asp His Ile
545 550 555 560

Asn Ala Met Ile Ser Asp Val Ile Lys Gly Leu Asn Trp Glu Leu Leu
565 570 575

Lys Pro Asp Ile Asn Val Pro Ile Ser Ala Lys Lys His Ala Phe Asp
580 585 590

Ile Ala Arg Ala Phe His Tyr Gly Tyr Lys Tyr Arg Asp Gly Tyr Ser
595 600 605

Val Ala Asn Val Glu Thr Lys Ser Leu Val Thr Arg Thr Leu Leu Glu
610 615 620

Ser Val Pro Leu
625

<210> 23
<211> 2089
<212> DNA
<213> Abies grandis

<400> 23
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ccaacactca gaatgcgtag gcgacagaaa gctctggtca tcaacatgaa attgaccact 240

gtatcccatc gtgatgataa tggtggtggt gtactgcaaa gacgcatagc cgatcatcat 300

cccaacctgt gggaagatga tttcatacaa tcattgtcct caccttatgg gggatcttcg 360

tacagtgaac gtgctgagac agtcgttgag gaagtaaaag agatgttcaa ttcaatacca 420

aataatagag aattatttgg ttcccaaaat gatctcctta cacgcctttg gatggtggat 480

agcattgaac gtctggggat agatagacat ttccaaaatg agataagagt agccctcgat 540

tatgtttaca gttattggaa ggaaaaggaa ggcattgggt gtggcagaga ttctactttt 600

cctgatctca actcgactgc cttggcgctt cgaactcttc gactgcacgg atacaatgtg 660

tcttcagatg tgctggaata cttcaaagat gaaaaggggc attttgcctg ccctgcaatc 720

ctaaccgagg gacagatcac tagaagtgtt ctaaatttat atcgggcttc cctggtcgcc 780

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gcaaaattgg agttcaatat ctttcactct ttgcaactaa gagagttaca atctatctcc 1080

agatggtgga aagaatcagg ttcgtctcaa ctgactttta cacggcatcg tcacgtggaa 1140

tactacacta tggcatcttg catttctatg ttgccaaaac attcagcttt cagaatggag 1200

tttgtcaaag tgtgtcatct tgtaacagtt ctcgatgata tatatgacac ttttggaaca 1260

atgaacgaac tccaactttt tacggatgca attaagagat gggatttgtc aacgacaagg 1320

tggcttccag aatatatgaa aggagtgtac atggacttgt atcaatgcat taatgaaatg 1380

gtggaagagg ctgagaagac tcaaggccga gatatgctca actatattca aaatgcttgg 1440

gaagccctat ttgatacctt tatgcaagaa gcaaagtgga tctccagcag ttatctccca 1500

acgtttgagg agtacttgaa gaatgcaaaa gttagttctg gttctcgcat agccacatta 1560

caacccattc tcactttgga tgtaccactt cctgattaca tactgcaaga aattgattat 1620

ccatccagat tcaatgagtt agcttcgtcc atccttcgac tacgaggtga cacgcgctgc 1680

tacaaggcgg atagggcccg tggagaagaa gcttcagcta tatcgtgtta tatgaaagac 1740

catcctggat caatagagga agatgctctc aatcatatca acgccatgat cagtgatgca 1800

atcagagaat taaattggga gcttctcaga ccggatagca aaagtcccat ctcttccaag 1860

aaacatgctt ttgacatcac cagagctttc catcatgtct acaaatatcg agatggttac 1920

actgtttcca acaacgaaac aaagaatttg gtgatgaaaa ccgttcttga acctctcgct 1980

ttgtaaaaac atatagaatg cattaaaatg tgggaagtct ataatctaga ctattctcta 2040

tctttcataa tgtagatctg gatgtgtatt gaactctaaa aaaaaaaaa 2089

<210> 24
<211> 637
<212> PRT
<213> Abies grandis

<400> 24

Met Ala Leu Leu Ser Ile Val Ser Leu Gln Val Pro Lys Ser Cys Gly
1 5 10 15

Leu Lys Ser Leu Ile Ser Ser Ser Asn Val Gln Lys Ala Leu Cys Ile
20 25 30

Ser Thr Ala Val Pro Thr Leu Arg Met Arg Arg Arg Gln Lys Ala Leu
35 40 45

Val Ile Asn Met Lys Leu Thr Thr Val Ser His Arg Asp Asp Asn Gly
50 55 60

Gly Gly Val Leu Gln Arg Arg Ile Ala Asp His His Pro Asn Leu Trp
65 70 75 80

Glu Asp Asp Phe Ile Gln Ser Leu Ser Ser Pro Tyr Gly Gly Ser Ser
85 90 95

Tyr Ser Glu Arg Ala Glu Thr Val Val Glu Glu Val Lys Glu Met Phe
100 105 110

Asn Ser Ile Pro Asn Asn Arg Glu Leu Phe Gly Ser Gln Asn Asp Leu
115 120 125

Leu Thr Arg Leu Trp Met Val Asp Ser Ile Glu Arg Leu Gly Ile Asp
130 135 140

Arg His Phe Gln Asn Glu Ile Arg Val Ala Leu Asp Tyr Val Tyr Ser
145 150 155 160

Tyr Trp Lys Glu Lys Glu Gly Ile Gly Cys Gly Arg Asp Ser Thr Phe
165 170 175

Pro Asp Leu Asn Ser Thr Ala Leu Ala Leu Arg Thr Leu Arg Leu His
180 185 190

Gly Tyr Asn Val Ser Ser Asp Val Leu Glu Tyr Phe Lys Asp Glu Lys
195 200 205

Gly His Phe Ala Cys Pro Ala Ile Leu Thr Glu Gly Gln Ile Thr Arg
210 215 220

Ser Val Leu Asn Leu Tyr Arg Ala Ser Leu Val Ala Phe Pro Gly Glu
225 230 235 240

Lys Val Met Glu Glu Ala Glu Ile Phe Ser Ala Ser Tyr Leu Lys Lys
245 250 255

Val Leu Gln Lys Ile Pro Val Ser Asn Leu Ser Gly Glu Ile Glu Tyr
260 265 270

Val Leu Glu Tyr Gly Trp His Thr Asn Leu Pro Arg Leu Glu Ala Arg
275 280 285

Asn Tyr Ile Glu Val Tyr Glu Gln Ser Gly Tyr Glu Ser Leu Asn Glu
290 295 300

Met Pro Tyr Met Asn Met Lys Lys Leu Leu Gln Leu Ala Lys Leu Glu
305 310 315 320

Phe Asn Ile Phe His Ser Leu Gln Leu Arg Glu Leu Gln Ser Ile Ser
325 330 335

Arg Trp Trp Lys Glu Ser Gly Ser Ser Gln Leu Thr Phe Thr Arg His
340 345 350

Arg His Val Glu Tyr Tyr Thr Met Ala Ser Cys Ile Ser Met Leu Pro
355 360 365

Lys His Ser Ala Phe Arg Met Glu Phe Val Lys Val Cys His Leu Val
370 375 380

Thr Val Leu Asp Asp Ile Tyr Asp Thr Phe Gly Thr Met Asn Glu Leu
385 390 395 400

Gln Leu Phe Thr Asp Ala Ile Lys Arg Trp Asp Leu Ser Thr Thr Arg
405 410 415

Trp Leu Pro Glu Tyr Met Lys Gly Val Tyr Met Asp Leu Tyr Gln Cys
420 425 430

Ile Asn Glu Met Val Glu Glu Ala Glu Lys Thr Gln Gly Arg Asp Met
435 440 445

Leu Asn Tyr Ile Gln Asn Ala Trp Glu Ala Leu Phe Asp Thr Phe Met
450 455 460

Gln Glu Ala Lys Trp Ile Ser Ser Ser Tyr Leu Pro Thr Phe Glu Glu
465 470 475 480

Tyr Leu Lys Asn Ala Lys Val Ser Ser Gly Ser Arg Ile Ala Thr Leu
485 490 495

Gln Pro Ile Leu Thr Leu Asp Val Pro Leu Pro Asp Tyr Ile Leu Gln
500 505 510

Glu Ile Asp Tyr Pro Ser Arg Phe Asn Glu Leu Ala Ser Ser Ile Leu
515 520 525

Arg Leu Arg Gly Asp Thr Arg Cys Tyr Lys Ala Asp Arg Ala Arg Gly
530 535 540

Glu Glu Ala Ser Ala Ile Ser Cys Tyr Met Lys Asp His Pro Gly Ser
545 550 555 560

Ile Glu Glu Asp Ala Leu Asn His Ile Asn Ala Met Ile Ser Asp Ala
565 570 575

Ile Arg Glu Leu Asn Trp Glu Leu Leu Arg Pro Asp Ser Lys Ser Pro
580 585 590

Ile Ser Ser Lys Lys His Ala Phe Asp Ile Thr Arg Ala Phe His His
595 600 605

Val Tyr Lys Tyr Arg Asp Gly Tyr Thr Val Ser Asn Asn Glu Thr Lys
610 615 620

Asn Leu Val Met Lys Thr Val Leu Glu Pro Leu Ala Leu
625 630 635

<210> 25
<211> 2196
<212> DNA
<213> Abies grandis

<400> 25
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gagcaagaat ggctctggtt tctatctcac cgttggcttc gaaatcttgc ctgcgcaagt 120

cgttgatcag ttcaattcat gaacataagc ctccctatag aacaatccca aatcttggaa 180

tgcgtaggcg agggaaatct gtcacgcctt ccatgagcat cagtttggcc accgctgcac 240

ctgatgatgg tgtacaaaga cgcataggtg actaccattc caatatctgg gacgatgatt 300

tcatacagtc tctatcaacg ccttatgggg aaccctctta ccaggaacgt gctgagagat 360

taattgtgga ggtaaagaag atattcaatt caatgtacct ggatgatgga agattaatga 420

gttcctttaa tgatctcatg caacgccttt ggatagtcga tagcgttgaa cgtttgggga 480

tagctagaca tttcaagaac gagataacat cagctctgga ttatgttttc cgttactggg 540

aggaaaacgg cattggatgt gggagagaca gtattgttac tgatctcaac tcaactgcgt 600

tggggtttcg aactcttcga ttacacgggt acactgtatc tccagaggtt ttaaaagctt 660

ttcaagatca aaatggacag tttgtatgct cccccggtca gacagagggt gagatcagaa 720

gcgttcttaa cttatatcgg gcttccctca ttgccttccc tggtgagaaa gttatggaag 780

aagctgaaat cttctccaca agatatttga aagaagctct acaaaagatt ccagtctccg 840

ctctttcaca agagataaag tttgttatgg aatatggctg gcacacaaat ttgccaagat 900

tggaagcaag aaattacata gacacacttg agaaagacac cagtgcatgg ctcaataaaa 960

atgctgggaa gaagctttta gaacttgcaa aattggagtt caatatattt aactccttac 1020

aacaaaagga attacaatat cttttgagat ggtggaaaga gtcggatttg cctaaattga 1080

catttgctcg gcatcgtcat gtggaattct acactttggc ctcttgtatt gccattgacc 1140

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agagatggaa ttcatcagag atagaacacc ttccagaata tatgaaatgt gtgtacatgg 1320

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ctctcaacta tgttcgaaag gcttgggagg cttattttga ttcatatatg gaagaagcaa 1440

aatggatctc taatggttat ctgccaatgt ttgaagagta ccatgagaat gggaaagtga 1500

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atctctacat atatcgagat ggctttagtg ttgccaacaa ggaaacaaaa aaattggtta 1920

tggaaacact ccttgaatct atgctttttt aactataacc atatccataa taataagctc 1980

ataatgctaa attattggcc ttatgacata gtttatgtat gtacttgtgt gaattcaatc 2040

atatcgtgtg ggtatgatta aaaagctaga gcttactagg ttagtaacat ggtgataaaa 2100

gttataaaat gtgagttata gagataccca tgttgaataa tgaattacaa aaagagaaat 2160

ttatgtagaa taagattgga agcttttcaa ttgttt 2196

<210> 26
<211> 627
<212> PRT
<213> Abies grandis

<400> 26

Met Ala Leu Val Ser Ile Ser Pro Leu Ala Ser Lys Ser Cys Leu Arg
1 5 10 15

Lys Ser Leu Ile Ser Ser Ile His Glu His Lys Pro Pro Tyr Arg Thr
20 25 30

Ile Pro Asn Leu Gly Met Arg Arg Arg Gly Lys Ser Val Thr Pro Ser
35 40 45

Met Ser Ile Ser Leu Ala Thr Ala Ala Pro Asp Asp Gly Val Gln Arg
50 55 60

Arg Ile Gly Asp Tyr His Ser Asn Ile Trp Asp Asp Asp Phe Ile Gln
65 70 75 80

Ser Leu Ser Thr Pro Tyr Gly Glu Pro Ser Tyr Gln Glu Arg Ala Glu
85 90 95

Arg Leu Ile Val Glu Val Lys Lys Ile Phe Asn Ser Met Tyr Leu Asp
100 105 110

Asp Gly Arg Leu Met Ser Ser Phe Asn Asp Leu Met Gln Arg Leu Trp
115 120 125

Ile Val Asp Ser Val Glu Arg Leu Gly Ile Ala Arg His Phe Lys Asn
130 135 140

Glu Ile Thr Ser Ala Leu Asp Tyr Val Phe Arg Tyr Trp Glu Glu Asn
145 150 155 160

Gly Ile Gly Cys Gly Arg Asp Ser Ile Val Thr Asp Leu Asn Ser Thr
165 170 175

Ala Leu Gly Phe Arg Thr Leu Arg Leu His Gly Tyr Thr Val Ser Pro
180 185 190

Glu Val Leu Lys Ala Phe Gln Asp Gln Asn Gly Gln Phe Val Cys Ser
195 200 205

Pro Gly Gln Thr Glu Gly Glu Ile Arg Ser Val Leu Asn Leu Tyr Arg
210 215 220

Ala Ser Leu Ile Ala Phe Pro Gly Glu Lys Val Met Glu Glu Ala Glu
225 230 235 240

Ile Phe Ser Thr Arg Tyr Leu Lys Glu Ala Leu Gln Lys Ile Pro Val
245 250 255

Ser Ala Leu Ser Gln Glu Ile Lys Phe Val Met Glu Tyr Gly Trp His
260 265 270

Thr Asn Leu Pro Arg Leu Glu Ala Arg Asn Tyr Ile Asp Thr Leu Glu
275 280 285

Lys Asp Thr Ser Ala Trp Leu Asn Lys Asn Ala Gly Lys Lys Leu Leu
290 295 300

Glu Leu Ala Lys Leu Glu Phe Asn Ile Phe Asn Ser Leu Gln Gln Lys
305 310 315 320

Glu Leu Gln Tyr Leu Leu Arg Trp Trp Lys Glu Ser Asp Leu Pro Lys
325 330 335

Leu Thr Phe Ala Arg His Arg His Val Glu Phe Tyr Thr Leu Ala Ser
340 345 350

Cys Ile Ala Ile Asp Pro Lys His Ser Ala Phe Arg Leu Gly Phe Ala
355 360 365

Lys Met Cys His Leu Val Thr Val Leu Asp Asp Ile Tyr Asp Thr Phe
370 375 380

Gly Thr Ile Asp Glu Leu Glu Leu Phe Thr Ser Ala Ile Lys Arg Trp
385 390 395 400

Asn Ser Ser Glu Ile Glu His Leu Pro Glu Tyr Met Lys Cys Val Tyr
405 410 415

Met Val Val Phe Glu Thr Val Asn Glu Leu Thr Arg Glu Ala Glu Lys
420 425 430

Thr Gln Gly Arg Asn Thr Leu Asn Tyr Val Arg Lys Ala Trp Glu Ala
435 440 445

Tyr Phe Asp Ser Tyr Met Glu Glu Ala Lys Trp Ile Ser Asn Gly Tyr
450 455 460

Leu Pro Met Phe Glu Glu Tyr His Glu Asn Gly Lys Val Ser Ser Ala
465 470 475 480

Tyr Arg Val Ala Thr Leu Gln Pro Ile Leu Thr Leu Asn Ala Trp Leu
485 490 495

Pro Asp Tyr Ile Leu Lys Gly Ile Asp Phe Pro Ser Arg Phe Asn Asp
500 505 510

Leu Ala Ser Ser Phe Leu Arg Leu Arg Gly Asp Thr Arg Cys Tyr Lys
515 520 525

Ala Asp Arg Asp Arg Gly Glu Glu Ala Ser Cys Ile Ser Cys Tyr Met
530 535 540

Lys Asp Asn Pro Gly Ser Thr Glu Glu Asp Ala Leu Asn His Ile Asn
545 550 555 560

Ala Met Val Asn Asp Ile Ile Lys Glu Leu Asn Trp Glu Leu Leu Arg
565 570 575

Ser Asn Asp Asn Ile Pro Met Leu Ala Lys Lys His Ala Phe Asp Ile
580 585 590

Thr Arg Ala Leu His His Leu Tyr Ile Tyr Arg Asp Gly Phe Ser Val
595 600 605

Ala Asn Lys Glu Thr Lys Lys Leu Val Met Glu Thr Leu Leu Glu Ser
610 615 620

Met Leu Phe
625

<210> 27
<211> 2429
<212> DNA
<213> Abies grandis

<400> 27

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tctctgtatc tctacagcag tcccaactct cagaatgcgt aggcgacaga aagctctggt 180

catcaacatg aaattgacca ctgtatccca tcgtgatgat aatggtggtg gtgtactgca 240

aagacgcata gccgatcatc atcccaacct gtgggaagat gatttcatac aatcattgtc 300

ctcaccttat gggggatctt cgtacagtga acgtgctgtg acagtggttg aggaagtaaa 360

agagatgttc aattcaatac caaataatag agaattattt ggttcccaaa atgatctcct 420

tacacgcctt tggatggtgg atagcattga acgtctgggg atagatagac atttccaaaa 480

tgagataaga gtagccctcg attatgttta cagttattgg aaggaaaagg aaggcattgg 540

gtgtggcaga gattctactt ttcctgatct caactcgact gctctggcgc ttcgaactct 600

tcgactgcac ggatacaatg tgtcttcaga tgtgctggaa tacttcaaag atcaaaaggg 660

gcattttgcc tgccctgcaa tcctaaccga gggacagatc actagaagtg ttctaaattt 720

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ctcggcatct tatttgaaag aagtcttaca aaagattcca gtctccagtt tttcacgaga 840

gatagaatac gttttggaat atggttggca cacaaatttg ccaagattgg aagcaagaaa 900

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tacgcagaag cttttaaaac ttgcaaaatt ggagtttaat atctttcact ctttgcaaca 1020

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atgggatttg tcagagacaa agtgtcttcc agaatatatg aaagcagtgt acatggactt 1320

gtatcaatgt cttaatgaat tggcgcaaga ggctgagaag actcaaggca gagatacgct 1380

caactatatt cgcaatgctt atgagtctca ttttgattcg tttatgcacg aagcaaaatg 1440

gatctcaagt ggttatctcc caacgtttga ggagtacttg aagaatggga aagttagttc 1500

cggttctcgc acagccactt tacaacccat actcaccttg gatgtaccac ttcctaatta 1560

catactgcaa gaaattgatt atccatctag gttcaatgac ttggcttcgt ccctccttcg 1620

gctacgtggt gacacgcgct gctacaaggc ggatagggct cgtggagaag aagcttcagc 1680

tatatcgtgt tatatgaaag accatcctgg atcaacagag gaagatgctc tcaatcatat 1740

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caaaagtccc atctcttcca agaaacatgc ttttgacatc accagagctt tccatcacct 1860

ctacaagtac cgagatggtt acactgttgc gagtagtgaa acaaagaatt tggtgatgaa 1920

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gcaccattac agtgtatatg ggagccagtc tagtctcaaa aagtttgtaa atgttattct 2100

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ctgccatata agataacggg agtgacaagg attttaaaga ggatttttt ttatgtcccg 2280

catcacaagg tttgtcgatt tacagttgtt ttcaagactg aagtaggatt tccaccctcc 2340

attaatcctc ttctcgatgt tatagtttca cttgagcttg tgatggaagt caattcctag 2400

atatttataa gaaaaaaaaa aaaaaaaaa 2429

<210> 28
<211> 637
<212> PRT
<213> Abies grandis

<400> 28

Met Ala Leu Leu Ser Ile Val Ser Leu Gln Val Pro Lys Ser Cys Gly
1 5 10 15

Leu Lys Ser Leu Ile Ser Ser Ser Asn Val Gln Lys Ala Leu Cys Ile
20 25 30

Ser Thr Ala Val Pro Thr Leu Arg Met Arg Arg Arg Gln Lys Ala Leu
35 40 45

Val Ile Asn Met Lys Leu Thr Thr Val Ser His Arg Asp Asp Asn Gly
50 55 60

Gly Gly Val Leu Gln Arg Arg Ile Ala Asp His His Pro Asn Leu Trp
65 70 75 80

Glu Asp Asp Phe Ile Gln Ser Leu Ser Ser Pro Tyr Gly Gly Ser Ser
85 90 95

Tyr Ser Glu Arg Ala Val Thr Val Val Glu Glu Val Lys Glu Met Phe
100 105 110

Asn Ser Ile Pro Asn Asn Arg Glu Leu Phe Gly Ser Gln Asn Asp Leu
115 120 125

Leu Thr Arg Leu Trp Met Val Asp Ser Ile Glu Arg Leu Gly Ile Asp
130 135 140

Arg His Phe Gln Asn Glu Ile Arg Val Ala Leu Asp Tyr Val Tyr Ser
145 150 155 160

Tyr Trp Lys Glu Lys Glu Gly Ile Gly Cys Gly Arg Asp Ser Thr Phe
165 170 175

Pro Asp Leu Asn Ser Thr Ala Leu Ala Leu Arg Thr Leu Arg Leu His
180 185 190

Gly Tyr Asn Val Ser Ser Asp Val Leu Glu Tyr Phe Lys Asp Gln Lys
195 200 205

Gly His Phe Ala Cys Pro Ala Ile Leu Thr Glu Gly Gln Ile Thr Arg
210 215 220

Ser Val Leu Asn Leu Tyr Arg Ala Ser Leu Val Ala Phe Pro Gly Glu
225 230 235 240

Lys Val Met Glu Glu Ala Glu Ile Phe Ser Ala Ser Tyr Leu Lys Glu
245 250 255

Val Leu Gln Lys Ile Pro Val Ser Ser Phe Ser Arg Glu Ile Glu Tyr
260 265 270

Val Leu Glu Tyr Gly Trp His Thr Asn Leu Pro Arg Leu Glu Ala Arg
275 280 285

Asn Tyr Ile Asp Val Tyr Gly Gln Asp Ser Tyr Glu Ser Ser Asn Glu
290 295 300

Met Pro Tyr Val Asn Thr Gln Lys Leu Leu Lys Leu Ala Lys Leu Glu
305 310 315 320

Phe Asn Ile Phe His Ser Leu Gln Gln Lys Glu Leu Gln Tyr Ile Ser
325 330 335

Arg Trp Trp Lys Asp Ser Cys Ser Ser His Leu Thr Phe Thr Arg His
340 345 350

Arg His Val Glu Tyr Tyr Thr Met Ala Ser Cys Ile Ser Met Glu Pro
355 360 365

Lys His Ser Ala Phe Arg Leu Gly Phe Val Lys Thr Cys His Leu Leu
370 375 380

Thr Val Leu Asp Asp Met Tyr Asp Thr Phe Gly Thr Leu Asp Glu Leu
385 390 395 400

Gln Leu Phe Thr Thr Ala Phe Lys Arg Trp Asp Leu Ser Glu Thr Lys
405 410 415

Cys Leu Pro Glu Tyr Met Lys Ala Val Tyr Met Asp Leu Tyr Gln Cys
420 425 430

Leu Asn Glu Leu Ala Gln Glu Ala Glu Lys Thr Gln Gly Arg Asp Thr
435 440 445

Leu Asn Tyr Ile Arg Asn Ala Tyr Glu Ser His Phe Asp Ser Phe Met
450 455 460

His Glu Ala Lys Trp Ile Ser Ser Gly Tyr Leu Pro Thr Phe Glu Glu
465 470 475 480

Tyr Leu Lys Asn Gly Lys Val Ser Ser Gly Ser Arg Thr Ala Thr Leu
485 490 495

Gln Pro Ile Leu Thr Leu Asp Val Pro Leu Pro Asn Tyr Ile Leu Gln
500 505 510

Glu Ile Asp Tyr Pro Ser Arg Phe Asn Asp Leu Ala Ser Ser Leu Leu
515 520 525

Arg Leu Arg Gly Asp Thr Arg Cys Tyr Lys Ala Asp Arg Ala Arg Gly
530 535 540

Glu Glu Ala Ser Ala Ile Ser Cys Tyr Met Lys Asp His Pro Gly Ser
545 550 555 560

Thr Glu Glu Asp Ala Leu Asn His Ile Asn Val Met Ile Ser Asp Ala
565 570 575

Ile Arg Glu Leu Asn Trp Glu Leu Leu Arg Pro Asp Ser Lys Ser Pro
580 585 590

Ile Ser Ser Lys Lys His Ala Phe Asp Ile Thr Arg Ala Phe His His
595 600 605

Leu Tyr Lys Tyr Arg Asp Gly Tyr Thr Val Ala Ser Ser Glu Thr Lys

610 615 620

Asn Leu Val Met Lys Thr Val Leu Glu Pro Val Ala Leu
625 630 635

<210> 29
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
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<220>
<221> misc_feature
<222> (1)..(20)
<223> n equals unknown

<400> 29
gcntaygaya cngcntgggt 20

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<220>
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<220>
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<222> (1)..(20)
<223> n equals unknown

<400> 30
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<210> 31
<211> 52
<212> DNA
<213> Artificial Sequence

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<223> Primer

<400> 31
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<210> 32
<211> 2622
<212> DNA
<213> Ginkgo biloba

<400> 32

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gcacagcact gcgtccgttc tcacttaagg ctgagatgga attgtgtcgg gattcatgcc 180

tcagctgcag agactcgtcc agatcagctt ccacaggagg aacgctttgt gtcgagactt 240

aatgcggatt atcatccagc tgtctggaag gacgatttca tcgactctct aacatcccct 300

aattcccacg cgacatcgaa atcaagcgtc gatgagacaa tcaataaaag aatccagaca 360

ttggtgaagg aaatccagtg catgtttcag tccatgggcg acggtgaaac gaatccatct 420

gcatatgata cagcttgggt ggcaagaatt ccgtcaattg acggctctgg tgcaccccaa 480

tttccccaaa cgcttcaatg gattctgaac aatcaactgc cagatggctc gtggggtgag 540

gagtgcattt ttctggcgta tgacagagtt ttaaacactc tcgcctgcct cctcactctc 600

aaaatatgga ataagggcga cattcaagtg cagaaagggg ttgagtttgt gagaaaacac 660

atggaagaaa tgaaggacga agctgacaat cacaggccaa gtggattcga ggtcgtgttt 720

cctgcaatgt tagatgaagc aaaaagcttg ggattggatc ttccttatca cctccctttc 780

atctcccaaa tccaccaaaa gcgccagaaa aagcttcaaa agattcccct caatgttctt 840

cataaccatc agacggcgtt gctctactct ctggagggtt tgcaagatgt ggtggactgg 900

caagagatca caaatcttca atcaagagac ggatcatttt taagctcccc tgcatctact 960

gcttgtgtct tcatgcacac tcaaaacaaa cgatgcctcc actttctcaa cttcgtgctc 1020

agcaaatttg gcgactacgt tccttgccat tacccacttg atctatttga acgcctctgg 1080

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accaaagaag ccgaatggtc ggcagcaaag tatgtgccga cattcaacga atatgtggaa 2160

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agagtgatgc agctgtttta tatgtacaga gatggctttg gtatctctga caaagagatg 2580

aaagaccatg tcagccgaac tcttttcgat cctgtggcgt ag 2622

<210> 33
<211> 873
<212> PRT
<213> Ginkgo biloba

<400> 33

Met Ala Gly Val Leu Phe Ala Asn Leu Pro Cys Ser Leu Gln Leu Ser
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Pro Lys Val Pro Phe Arg Gln Ser Thr Asn Ile Leu Ile Pro Phe His
20 25 30

Lys Arg Ser Ser Phe Gly Phe Asn Ala Gln His Cys Val Arg Ser His
35 40 45

Leu Arg Leu Arg Trp Asn Cys Val Gly Ile His Ala Ser Ala Ala Glu
50 55 60

Thr Arg Pro Asp Gln Leu Pro Gln Glu Glu Arg Phe Val Ser Arg Leu
65 70 75 80

Asn Ala Asp Tyr His Pro Ala Val Trp Lys Asp Asp Phe Ile Asp Ser
85 90 95

Leu Thr Ser Pro Asn Ser His Ala Thr Ser Lys Ser Ser Val Asp Glu
100 105 110

Thr Ile Asn Lys Arg Ile Gln Thr Leu Val Lys Glu Ile Gln Cys Met
115 120 125

Phe Gln Ser Met Gly Asp Gly Glu Thr Asn Pro Ser Ala Tyr Asp Thr
130 135 140

Ala Trp Val Ala Arg Ile Pro Ser Ile Asp Gly Ser Gly Ala Pro Gln
145 150 155 160

Phe Pro Gln Thr Leu Gln Trp Ile Leu Asn Asn Gln Leu Pro Asp Gly
165 170 175

Ser Trp Gly Glu Glu Cys Ile Phe Leu Ala Tyr Asp Arg Val Leu Asn
180 185 190

Thr Leu Ala Cys Leu Leu Thr Leu Lys Ile Trp Asn Lys Gly Asp Ile
195 200 205

Gln Val Gln Lys Gly Val Glu Phe Val Arg Lys His Met Glu Glu Met
210 215 220

Lys Asp Glu Ala Asp Asn His Arg Pro Ser Gly Phe Glu Val Val Phe
225 230 235 240

Pro Ala Met Leu Asp Glu Ala Lys Ser Leu Gly Leu Asp Leu Pro Tyr
245 250 255

His Leu Pro Phe Ile Ser Gln Ile His Gln Lys Arg Gln Lys Lys Leu
260 265 270

Gln Lys Ile Pro Leu Asn Val Leu His Asn His Gln Thr Ala Leu Leu
275 280 285

Tyr Ser Leu Glu Gly Leu Gln Asp Val Val Asp Trp Gln Glu Ile Thr
290 295 300

Asn Leu Gln Ser Arg Asp Gly Ser Phe Leu Ser Ser Pro Ala Ser Thr
305 310 315 320

Ala Cys Val Phe Met His Thr Gln Asn Lys Arg Cys Leu His Phe Leu
325 330 335

Asn Phe Val Leu Ser Lys Phe Gly Asp Tyr Val Pro Cys His Tyr Pro
340 345 350

Leu Asp Leu Phe Glu Arg Leu Trp Ala Val Asp Thr Val Glu Arg Leu
355 360 365

Gly Ile Asp Arg Tyr Phe Lys Lys Glu Ile Lys Glu Ser Leu Asp Tyr
370 375 380

Val Tyr Arg Tyr Trp Asp Ala Glu Arg Gly Val Gly Trp Ala Arg Cys
385 390 395 400

Asn Pro Ile Pro Asp Val Asp Asp Thr Ala Met Gly Leu Arg Ile Leu
405 410 415

Arg Leu His Gly Tyr Asn Val Ser Ser Asp Val Leu Glu Asn Phe Arg
420 425 430

Asp Glu Lys Gly Asp Phe Phe Cys Phe Ala Gly Gln Thr Gln Ile Gly
435 440 445

Val Thr Asp Asn Leu Asn Leu Tyr Arg Cys Ser Gln Val Cys Phe Pro
450 455 460

Gly Glu Lys Ile Met Glu Glu Ala Lys Thr Phe Thr Thr Asn His Leu
465 470 475 480

Gln Asn Ala Leu Ala Lys Asn Asn Ala Phe Asp Lys Trp Ala Val Lys
485 490 495

Lys Asp Leu Pro Gly Glu Val Glu Tyr Ala Ile Lys Tyr Pro Trp His
500 505 510

Arg Ser Met Pro Arg Leu Glu Ala Arg Ser Tyr Ile Glu Gln Phe Gly
515 520 525

Ser Asn Asp Val Trp Leu Gly Lys Thr Val Tyr Lys Met Leu Tyr Val
530 535 540

Ser Asn Glu Lys Tyr Leu Glu Leu Ala Lys Leu Asp Phe Asn Met Val
545 550 555 560

Gln Ala Leu His Gln Lys Glu Thr Gln His Ile Val Ser Trp Trp Arg
565 570 575

Glu Ser Gly Phe Asn Asp Leu Thr Phe Thr Arg Gln Arg Pro Val Glu
580 585 590

Met Tyr Phe Ser Val Ala Val Ser Met Phe Glu Pro Glu Phe Ala Ala
595 600 605

Cys Arg Ile Ala Tyr Ala Lys Thr Ser Cys Leu Ala Val Ile Leu Asp
610 615 620

Asp Leu Tyr Asp Thr His Gly Ser Leu Asp Asp Leu Lys Leu Phe Ser
625 630 635 640

Glu Ala Val Arg Arg Trp Asp Ile Ser Val Leu Asp Ser Val Arg Asp
645 650 655

Asn Gln Leu Lys Val Cys Phe Leu Gly Leu Tyr Asn Thr Val Asn Gly
660 665 670

Phe Gly Lys Asp Gly Leu Lys Glu Gln Gly Arg Asp Val Leu Gly Tyr
675 680 685

Leu Arg Lys Val Trp Glu Gly Leu Leu Ala Ser Tyr Thr Lys Glu Ala
690 695 700

Glu Trp Ser Ala Ala Lys Tyr Val Pro Thr Phe Asn Glu Tyr Val Glu
705 710 715 720

Asn Ala Lys Val Ser Ile Ala Leu Ala Thr Val Val Leu Asn Ser Ile
725 730 735

Phe Phe Thr Gly Glu Leu Leu Pro Asp Tyr Ile Leu Gln Gln Val Asp
740 745 750

Leu Arg Ser Lys Phe Leu His Leu Val Ser Leu Thr Gly Arg Leu Ile
755 760 765

Asn Asp Thr Lys Thr Tyr Gln Ala Glu Arg Asn Arg Gly Glu Leu Val
770 775 780

Ser Ser Val Gln Cys Tyr Met Arg Glu Asn Pro Glu Cys Thr Glu Glu
785 790 795 800

Glu Ala Leu Ser His Val Tyr Gly Ile Ile Asp Asn Ala Leu Lys Glu
805 810 815

Leu Asn Trp Glu Leu Ala Asn Pro Ala Ser Asn Ala Pro Leu Cys Val
820 825 830

Arg Arg Leu Leu Phe Asn Thr Ala Arg Val Met Gln Leu Phe Tyr Met

835 840 845

Tyr Arg Asp Gly Phe Gly Ile Ser Asp Lys Glu Met Lys Asp His Val
850 855 860

Ser Arg Thr Leu Phe Asp Pro Val Ala
865 870

<210> 34
<211> 2445
<212> DNA
<213> Ginkgo biloba

<400> 34
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cttaatgcgg attatcatcc agctgtctgg aaggacgatt tcatcgactc tctaacatcc 120

cctaattccc acgcgacatc gaaatcaagc gtcgatgaga caatcaataa aagaatccag 180

acattggtga aggaaatcca gtgcatgttt cagtccatgg gcgacggtga aacgaatcca 240

tctgcatatg atacagcttg ggtggcaaga attccgtcaa ttgacggctc tggtgcaccc 300

caatttcccc aaacgcttca atggattctg aacaatcaac tgccagatgg ctcgtggggt 360

gaggagtgca tttttctggc gtatgacaga gttttaaaca ctctcgcctg cctcctcact 420

ctcaaaatat ggaataaggg cgacattcaa gtgcagaaag gggttgagtt tgtgagaaaa 480

cacatggaag aaatgaagga cgaagctgac aatcacaggc caagtggatt cgaggtcgtg 540

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ttcatctccc aaatccacca aaagcgccag aaaaagcttc aaaagattcc cctcaatgtt 660

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tggcaagaga tcacaaatct tcaatcaaga gacggatcat ttttaagctc ccctgcatct 780

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caagtatgtt ttccgggaga aaagataatg gaagaagcta agaccttcac tacaaatcat 1260

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cctggagagg tggagtatgc tataaagtat ccgtggcata gaagtatgcc aagattggag 1380

gcaagaagtt acatagagca atttggatca aatgatgtct ggctggggaa gactgtgtat 1440

aagatgctat atgtgagcaa cgaaaaatat ttggagctgg ccaaattgga cttcaatatg 1500

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gaaaatgcca aagtgtccat agcacttgcg acagtcgtac taaactcaat ctttttcact 2040

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gaagaagctc taagtcatgt ttatggtatc atcgacaacg cactgaagga attgaattgg 2280

gagttggcca acccagcgag caatgcccca ttgtgtgtga gaagactgct gttcaacact 2340

gcaagagtga tgcagctgtt ttatatgtac agagatggct ttggtatctc tgacaaagag 2400

atgaaagacc atgtcagccg aactcttttc gatcctgtgg cgtag 2445

<210> 35
<211> 814
<212> PRT
<213> Ginkgo biloba

<400> 35

Met Ser Ala Ala Glu Thr Arg Pro Asp Gln Leu Pro Gln Glu Glu Arg
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Phe Val Ser Arg Leu Asn Ala Asp Tyr His Pro Ala Val Trp Lys Asp
20 25 30

Asp Phe Ile Asp Ser Leu Thr Ser Pro Asn Ser His Ala Thr Ser Lys
35 40 45

Ser Ser Val Asp Glu Thr Ile Asn Lys Arg Ile Gln Thr Leu Val Lys
50 55 60

Glu Ile Gln Cys Met Phe Gln Ser Met Gly Asp Gly Glu Thr Asn Pro
65 70 75 80

Ser Ala Tyr Asp Thr Ala Trp Val Ala Arg Ile Pro Ser Ile Asp Gly
85 90 95

Ser Gly Ala Pro Gln Phe Pro Gln Thr Leu Gln Trp Ile Leu Asn Asn
100 105 110

Gln Leu Pro Asp Gly Ser Trp Gly Glu Glu Cys Ile Phe Leu Ala Tyr
115 120 125

Asp Arg Val Leu Asn Thr Leu Ala Cys Leu Leu Thr Leu Lys Ile Trp
130 135 140

Asn Lys Gly Asp Ile Gln Val Gln Lys Gly Val Glu Phe Val Arg Lys
145 150 155 160

His Met Glu Glu Met Lys Asp Glu Ala Asp Asn His Arg Pro Ser Gly
165 170 175

Phe Glu Val Val Phe Pro Ala Met Leu Asp Glu Ala Lys Ser Leu Gly
180 185 190

Leu Asp Leu Pro Tyr His Leu Pro Phe Ile Ser Gln Ile His Gln Lys
195 200 205

Arg Gln Lys Lys Leu Gln Lys Ile Pro Leu Asn Val Leu His Asn His
210 215 220

Gln Thr Ala Leu Leu Tyr Ser Leu Glu Gly Leu Gln Asp Val Val Asp
225 230 235 240

Trp Gln Glu Ile Thr Asn Leu Gln Ser Arg Asp Gly Ser Phe Leu Ser
245 250 255

Ser Pro Ala Ser Thr Ala Cys Val Phe Met His Thr Gln Asn Lys Arg
260 265 270

Cys Leu His Phe Leu Asn Phe Val Leu Ser Lys Phe Gly Asp Tyr Val
275 280 285

Pro Cys His Tyr Pro Leu Asp Leu Phe Glu Arg Leu Trp Ala Val Asp
290 295 300

Thr Val Glu Arg Leu Gly Ile Asp Arg Tyr Phe Lys Lys Glu Ile Lys
305 310 315 320

Glu Ser Leu Asp Tyr Val Tyr Arg Tyr Trp Asp Ala Glu Arg Gly Val
325 330 335

Gly Trp Ala Arg Cys Asn Pro Ile Pro Asp Val Asp Asp Thr Ala Met
340 345 350

Gly Leu Arg Ile Leu Arg Leu His Gly Tyr Asn Val Ser Ser Asp Val
355 360 365

Leu Glu Asn Phe Arg Asp Glu Lys Gly Asp Phe Phe Cys Phe Ala Gly
370 375 380

Gln Thr Gln Ile Gly Val Thr Asp Asn Leu Asn Leu Tyr Arg Cys Ser
385 390 395 400

Gln Val Cys Phe Pro Gly Glu Lys Ile Met Glu Glu Ala Lys Thr Phe
405 410 415

Thr Thr Asn His Leu Gln Asn Ala Leu Ala Lys Asn Asn Ala Phe Asp
420 425 430

Lys Trp Ala Val Lys Lys Asp Leu Pro Gly Glu Val Glu Tyr Ala Ile
435 440 445

Lys Tyr Pro Trp His Arg Ser Met Pro Arg Leu Glu Ala Arg Ser Tyr
450 455 460

Ile Glu Gln Phe Gly Ser Asn Asp Val Trp Leu Gly Lys Thr Val Tyr
465 470 475 480

Lys Met Leu Tyr Val Ser Asn Glu Lys Tyr Leu Glu Leu Ala Lys Leu
485 490 495

Asp Phe Asn Met Val Gln Ala Leu His Gln Lys Glu Thr Gln His Ile
500 505 510

Val Ser Trp Trp Arg Glu Ser Gly Phe Asn Asp Leu Thr Phe Thr Arg
515 520 525

Gln Arg Pro Val Glu Met Tyr Phe Ser Val Ala Val Ser Met Phe Glu
530 535 540

Pro Glu Phe Ala Ala Cys Arg Ile Ala Tyr Ala Lys Thr Ser Cys Leu

545 550 555 560

Ala Val Ile Leu Asp Asp Leu Tyr Asp Thr His Gly Ser Leu Asp Asp
565 570 575

Leu Lys Leu Phe Ser Glu Ala Val Arg Arg Trp Asp Ile Ser Val Leu
580 585 590

Asp Ser Val Arg Asp Asn Gln Leu Lys Val Cys Phe Leu Gly Leu Tyr
595 600 605

Asn Thr Val Asn Gly Phe Gly Lys Asp Gly Leu Lys Glu Gln Gly Arg
610 615 620

Asp Val Leu Gly Tyr Leu Arg Lys Val Trp Glu Gly Leu Leu Ala Ser
625 630 635 640

Tyr Thr Lys Glu Ala Glu Trp Ser Ala Ala Lys Tyr Val Pro Thr Phe
645 650 655

Asn Glu Tyr Val Glu Asn Ala Lys Val Ser Ile Ala Leu Ala Thr Val
660 665 670

Val Leu Asn Ser Ile Phe Phe Thr Gly Glu Leu Leu Pro Asp Tyr Ile
675 680 685

Leu Gln Gln Val Asp Leu Arg Ser Lys Phe Leu His Leu Val Ser Leu
690 695 700

Thr Gly Arg Leu Ile Asn Asp Thr Lys Thr Tyr Gln Ala Glu Arg Asn
705 710 715 720

Arg Gly Glu Leu Val Ser Ser Val Gln Cys Tyr Met Arg Glu Asn Pro
725 730 735

Glu Cys Thr Glu Glu Glu Ala Leu Ser His Val Tyr Gly Ile Ile Asp
740 745 750

Asn Ala Leu Lys Glu Leu Asn Trp Glu Leu Ala Asn Pro Ala Ser Asn
755 760 765

Ala Pro Leu Cys Val Arg Arg Leu Leu Phe Asn Thr Ala Arg Val Met
770 775 780

Gln Leu Phe Tyr Met Tyr Arg Asp Gly Phe Gly Ile Ser Asp Lys Glu
785 790 795 800

Met Lys Asp His Val Ser Arg Thr Leu Phe Asp Pro Val Ala
805 810

<210> 36
<211> 2388
<212> DNA
<213> Ginkgo biloba

<400> 36
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tcccctaatt cccacgcgac atcgaaatca agcgtcgatg agacaatcaa taaaagaatc 120

cagacattgg tgaaggaaat ccagtgcatg tttcagtcca tgggcgacgg tgaaacgaat 180

ccatctgcat atgatacagc ttgggtggca agaattccgt caattgacgg ctctggtgca 240

ccccaatttc cccaaacgct tcaatggatt ctgaacaatc aactgccaga tggctcgtgg 300

ggtgaggagt gcatttttct ggcgtatgac agagttttaa acactctcgc ctgcctcctc 360

actctcaaaa tatggaataa gggcgacatt caagtgcaga aaggggttga gtttgtgaga 420

aaacacatgg aagaaatgaa ggacgaagct gacaatcaca ggccaagtgg attcgaggtc 480

gtgtttcctg caatgttaga tgaagcaaaa agcttgggat tggatcttcc ttatcacctc 540

cctttcatct cccaaatcca ccaaaagcgc cagaaaaagc ttcaaaagat tcccctcaat 600

gttcttcata accatcagac ggcgttgctc tactctctgg agggtttgca agatgtggtg 660

gactggcaag agatcacaaa tcttcaatca agagacggat catttttaag ctcccctgca 720

tctactgctt gtgtcttcat gcacactcaa aacaaacgat gcctccactt tctcaacttc 780

gtgctcagca aatttggcga ctacgttcct tgccattacc cacttgatct atttgaacgc 840

ctctgggctg tcgatacagt tgaacgcttg ggaatcgatc gctatttcaa gaaagaaatc 900

aaagaatctc tggattacgt ttataggtac tgggacgccg aaagaggcgt gggatgggca 960

agatgcaatc ctattcctga tgtcgatgac actgccatgg gtcttagaat cctgagactt 1020

catggataca atgtatcttc agatgttctg gagaatttca gagacgagaa aggagacttc 1080

ttttgctttg ccggtcaaac gcaaattggt gtgaccgata atcttaacct ttatagatgt 1140

tcacaagtat gttttccggg agaaaagata atggaagaag ctaagacctt cactacaaat 1200

catctccaaa atgctcttgc caaaaacaac gcatttgata agtgggctgt caagaaggat 1260

cttcctggag aggtggagta tgctataaag tatccgtggc atagaagtat gccaagattg 1320

gaggcaagaa gttacataga gcaatttgga tcaaatgatg tctggctggg gaagactgtg 1380

tataagatgc tatatgtgag caacgaaaaa tatttggagc tggccaaatt ggacttcaat 1440

atggtgcagg ccttacacca aaaggagact caacacattg tcagctggtg gagagaatcg 1500

ggattcaatg atcttacatt cacccgccag cggcctgtgg aaatgtattt ctcagtggcg 1560

gttagtatgt ttgagccaga attcgctgct tgtagaattg cctatgccaa gacttcttgc 1620

ctcgcagtta ttctagacga tctttacgac acccacggat ctctggatga tcttaaattg 1680

ttctctgaag cggtccgaag atgggatatc tctgtgctgg atagcgttcg ggataatcag 1740

ttgaaagttt gcttcctagg gctgtacaac acagtgaatg gatttggaaa agatggactc 1800

aaggaacaag gccgtgatgt gctgggctat cttcgaaaag tatgggaggg cttgctcgca 1860

tcgtatacca aagaagccga atggtcggca gcaaagtatg tgccgacatt caacgaatat 1920

gtggaaaatg ccaaagtgtc catagcactt gcgacagtcg tactaaactc aatctttttc 1980

actggagaat tacttcctga ttacatttta cagcaagtag accttcggtc caaatttctg 2040

catcttgtgt ctttgactgg acgactaatc aatgacacca agacttacca ggccgagaga 2100

aaccgtggtg aattggtttc cagcgtacag tgctacatga gggaaaatcc ggagtgcaca 2160

gaggaagaag ctctaagtca tgtttatggt atcatcgaca acgcactgaa ggaattgaat 2220

tgggagttgg ccaacccagc gagcaatgcc ccattgtgtg tgagaagact gctgttcaac 2280

actgcaagag tgatgcagct gttttatatg tacagagatg gctttggtat ctctgacaaa 2340

gagatgaaag accatgtcag ccgaactctt ttcgatcctg tggcgtag 2388

<210> 37
<211> 795
<212> PRT
<213> Ginkgo biloba

<400> 37

Met Leu Asn Ala Asp Tyr His Pro Ala Val Trp Lys Asp Asp Phe Ile
1 5 10 15

Asp Ser Leu Thr Ser Pro Asn Ser His Ala Thr Ser Lys Ser Ser Val
20 25 30

Asp Glu Thr Ile Asn Lys Arg Ile Gln Thr Leu Val Lys Glu Ile Gln
35 40 45

Cys Met Phe Gln Ser Met Gly Asp Gly Glu Thr Asn Pro Ser Ala Tyr
50 55 60

Asp Thr Ala Trp Val Ala Arg Ile Pro Ser Ile Asp Gly Ser Gly Ala
65 70 75 80

Pro Gln Phe Pro Gln Thr Leu Gln Trp Ile Leu Asn Asn Gln Leu Pro
85 90 95

Asp Gly Ser Trp Gly Glu Glu Cys Ile Phe Leu Ala Tyr Asp Arg Val
100 105 110

Leu Asn Thr Leu Ala Cys Leu Leu Thr Leu Lys Ile Trp Asn Lys Gly
115 120 125

Asp Ile Gln Val Gln Lys Gly Val Glu Phe Val Arg Lys His Met Glu
130 135 140

Glu Met Lys Asp Glu Ala Asp Asn His Arg Pro Ser Gly Phe Glu Val
145 150 155 160

Val Phe Pro Ala Met Leu Asp Glu Ala Lys Ser Leu Gly Leu Asp Leu
165 170 175

Pro Tyr His Leu Pro Phe Ile Ser Gln Ile His Gln Lys Arg Gln Lys
180 185 190

Lys Leu Gln Lys Ile Pro Leu Asn Val Leu His Asn His Gln Thr Ala
195 200 205

Leu Leu Tyr Ser Leu Glu Gly Leu Gln Asp Val Val Asp Trp Gln Glu
210 215 220

Ile Thr Asn Leu Gln Ser Arg Asp Gly Ser Phe Leu Ser Ser Pro Ala
225 230 235 240

Ser Thr Ala Cys Val Phe Met His Thr Gln Asn Lys Arg Cys Leu His
245 250 255

Phe Leu Asn Phe Val Leu Ser Lys Phe Gly Asp Tyr Val Pro Cys His
260 265 270

Tyr Pro Leu Asp Leu Phe Glu Arg Leu Trp Ala Val Asp Thr Val Glu
275 280 285

Arg Leu Gly Ile Asp Arg Tyr Phe Lys Lys Glu Ile Lys Glu Ser Leu
290 295 300

Asp Tyr Val Tyr Arg Tyr Trp Asp Ala Glu Arg Gly Val Gly Trp Ala
305 310 315 320

Arg Cys Asn Pro Ile Pro Asp Val Asp Asp Thr Ala Met Gly Leu Arg
325 330 335

Ile Leu Arg Leu His Gly Tyr Asn Val Ser Ser Asp Val Leu Glu Asn
340 345 350

Phe Arg Asp Glu Lys Gly Asp Phe Phe Cys Phe Ala Gly Gln Thr Gln
355 360 365

Ile Gly Val Thr Asp Asn Leu Asn Leu Tyr Arg Cys Ser Gln Val Cys
370 375 380

Phe Pro Gly Glu Lys Ile Met Glu Glu Ala Lys Thr Phe Thr Thr Asn
385 390 395 400

His Leu Gln Asn Ala Leu Ala Lys Asn Asn Ala Phe Asp Lys Trp Ala
405 410 415

Val Lys Lys Asp Leu Pro Gly Glu Val Glu Tyr Ala Ile Lys Tyr Pro
420 425 430

Trp His Arg Ser Met Pro Arg Leu Glu Ala Arg Ser Tyr Ile Glu Gln
435 440 445

Phe Gly Ser Asn Asp Val Trp Leu Gly Lys Thr Val Tyr Lys Met Leu
450 455 460

Tyr Val Ser Asn Glu Lys Tyr Leu Glu Leu Ala Lys Leu Asp Phe Asn
465 470 475 480

Met Val Gln Ala Leu His Gln Lys Glu Thr Gln His Ile Val Ser Trp
485 490 495

Trp Arg Glu Ser Gly Phe Asn Asp Leu Thr Phe Thr Arg Gln Arg Pro
500 505 510

Val Glu Met Tyr Phe Ser Val Ala Val Ser Met Phe Glu Pro Glu Phe
515 520 525

Ala Ala Cys Arg Ile Ala Tyr Ala Lys Thr Ser Cys Leu Ala Val Ile
530 535 540

Leu Asp Asp Leu Tyr Asp Thr His Gly Ser Leu Asp Asp Leu Lys Leu
545 550 555 560

Phe Ser Glu Ala Val Arg Arg Trp Asp Ile Ser Val Leu Asp Ser Val
565 570 575

Arg Asp Asn Gln Leu Lys Val Cys Phe Leu Gly Leu Tyr Asn Thr Val
580 585 590

Asn Gly Phe Gly Lys Asp Gly Leu Lys Glu Gln Gly Arg Asp Val Leu
595 600 605

Gly Tyr Leu Arg Lys Val Trp Glu Gly Leu Leu Ala Ser Tyr Thr Lys
610 615 620

Glu Ala Glu Trp Ser Ala Ala Lys Tyr Val Pro Thr Phe Asn Glu Tyr
625 630 635 640

Val Glu Asn Ala Lys Val Ser Ile Ala Leu Ala Thr Val Val Leu Asn
645 650 655

Ser Ile Phe Phe Thr Gly Glu Leu Leu Pro Asp Tyr Ile Leu Gln Gln
660 665 670

Val Asp Leu Arg Ser Lys Phe Leu His Leu Val Ser Leu Thr Gly Arg
675 680 685

Leu Ile Asn Asp Thr Lys Thr Tyr Gln Ala Glu Arg Asn Arg Gly Glu
690 695 700

Leu Val Ser Ser Val Gln Cys Tyr Met Arg Glu Asn Pro Glu Cys Thr
705 710 715 720

Glu Glu Glu Ala Leu Ser His Val Tyr Gly Ile Ile Asp Asn Ala Leu
725 730 735

Lys Glu Leu Asn Trp Glu Leu Ala Asn Pro Ala Ser Asn Ala Pro Leu
740 745 750

Cys Val Arg Arg Leu Leu Phe Asn Thr Ala Arg Val Met Gln Leu Phe
755 760 765

Tyr Met Tyr Arg Asp Gly Phe Gly Ile Ser Asp Lys Glu Met Lys Asp
770 775 780

His Val Ser Arg Thr Leu Phe Asp Pro Val Ala
785 790 795

<210> 38
<211> 2241
<212> DNA
<213> Ginkgo biloba

<400> 38
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gcaagaattc cgtcaattga cggctctggt gcaccccaat ttccccaaac gcttcaatgg 120

attctgaaca atcaactgcc agatggctcg tggggtgagg agtgcatttt tctggcgtat 180

gacagagttt taaacactct cgcctgcctc ctcactctca aaatatggaa taagggcgac 240

attcaagtgc agaaaggggt tgagtttgtg agaaaacaca tggaagaaat gaaggacgaa 300

gctgacaatc acaggccaag tggattcgag gtcgtgtttc ctgcaatgtt agatgaagca 360

aaaagcttgg gattggatct tccttatcac ctccctttca tctcccaaat ccaccaaaag 420

cgccagaaaa agcttcaaaa gattcccctc aatgttcttc ataaccatca gacggcgttg 480

ctctactctc tggagggttt gcaagatgtg gtggactggc aagagatcac aaatcttcaa 540

tcaagagacg gatcattttt aagctcccct gcatctactg cttgtgtctt catgcacact 600

caaaacaaac gatgcctcca ctttctcaac ttcgtgctca gcaaatttgg cgactacgtt 660

ccttgccatt acccacttga tctatttgaa cgcctctggg ctgtcgatac agttgaacgc 720

ttgggaatcg atcgctattt caagaaagaa atcaaagaat ctctggatta cgtttatagg 780

tactgggacg ccgaaagagg cgtgggatgg gcaagatgca atcctattcc tgatgtcgat 840

gacactgcca tgggtcttag aatcctgaga cttcatggat acaatgtatc ttcagatgtt 900

ctggagaatt tcagagacga gaaaggagac ttcttttgct ttgccggtca aacgcaaatt 960

ggtgtgaccg ataatcttaa cctttataga tgttcacaag tatgttttcc gggagaaaag 1020

ataatggaag aagctaagac cttcactaca aatcatctcc aaaatgctct tgccaaaaac 1080

aacgcatttg ataagtgggc tgtcaagaag gatcttcctg gagaggtgga gtatgctata 1140

aagtatccgt ggcatagaag tatgccaaga ttggaggcaa gaagttacat agagcaattt 1200

ggatcaaatg atgtctggct ggggaagact gtgtataaga tgctatatgt gagcaacgaa 1260

aaatatttgg agctggccaa attggacttc aatatggtgc aggccttaca ccaaaaggag 1320

actcaacaca ttgtcagctg gtggagagaa tcgggattca atgatcttac attcacccgc 1380

cagcggcctg tggaaatgta tttctcagtg gcggttagta tgtttgagcc agaattcgct 1440

gcttgtagaa ttgcctatgc caagacttct tgcctcgcag ttattctaga cgatctttac 1500

gacacccacg gatctctgga tgatcttaaa ttgttctctg aagcggtccg aagatgggat 1560

atctctgtgc tggatagcgt tcgggataat cagttgaaag tttgcttcct agggctgtac 1620

aacacagtga atggatttgg aaaagatgga ctcaaggaac aaggccgtga tgtgctgggc 1680

tatcttcgaa aagtatggga gggcttgctc gcatcgtata ccaaagaagc cgaatggtcg 1740

gcagcaaagt atgtgccgac attcaacgaa tatgtggaaa atgccaaagt gtccatagca 1800

cttgcgacag tcgtactaaa ctcaatcttt ttcactggag aattacttcc tgattacatt 1860

ttacagcaag tagaccttcg gtccaaattt ctgcatcttg tgtctttgac tggacgacta 1920

atcaatgaca ccaagactta ccaggccgag agaaaccgtg gtgaattggt ttccagcgta 1980

cagtgctaca tgagggaaaa tccggagtgc acagaggaag aagctctaag tcatgtttat 2040

ggtatcatcg acaacgcact gaaggaattg aattgggagt tggccaaccc agcgagcaat 2100

gccccattgt gtgtgagaag actgctgttc aacactgcaa gagtgatgca gctgttttat 2160

atgtacagag atggctttgg tatctctgac aaagagatga aagaccatgt cagccgaact 2220

cttttcgatc ctgtggcgta g 2241

<210> 39
<211> 746
<212> PRT
<213> Ginkgo biloba

<400> 39

Met Phe Gln Ser Met Gly Asp Gly Glu Thr Asn Pro Ser Ala Tyr Asp
1 5 10 15

Thr Ala Trp Val Ala Arg Ile Pro Ser Ile Asp Gly Ser Gly Ala Pro
20 25 30

Gln Phe Pro Gln Thr Leu Gln Trp Ile Leu Asn Asn Gln Leu Pro Asp
35 40 45

Gly Ser Trp Gly Glu Glu Cys Ile Phe Leu Ala Tyr Asp Arg Val Leu
50 55 60

Asn Thr Leu Ala Cys Leu Leu Thr Leu Lys Ile Trp Asn Lys Gly Asp
65 70 75 80

Ile Gln Val Gln Lys Gly Val Glu Phe Val Arg Lys His Met Glu Glu
85 90 95

Met Lys Asp Glu Ala Asp Asn His Arg Pro Ser Gly Phe Glu Val Val
100 105 110

Phe Pro Ala Met Leu Asp Glu Ala Lys Ser Leu Gly Leu Asp Leu Pro
115 120 125

Tyr His Leu Pro Phe Ile Ser Gln Ile His Gln Lys Arg Gln Lys Lys
130 135 140

Leu Gln Lys Ile Pro Leu Asn Val Leu His Asn His Gln Thr Ala Leu

145 150 155 160

Leu Tyr Ser Leu Glu Gly Leu Gln Asp Val Val Asp Trp Gln Glu Ile
165 170 175

Thr Asn Leu Gln Ser Arg Asp Gly Ser Phe Leu Ser Ser Pro Ala Ser
180 185 190

Thr Ala Cys Val Phe Met His Thr Gln Asn Lys Arg Cys Leu His Phe
195 200 205

Leu Asn Phe Val Leu Ser Lys Phe Gly Asp Tyr Val Pro Cys His Tyr
210 215 220

Pro Leu Asp Leu Phe Glu Arg Leu Trp Ala Val Asp Thr Val Glu Arg
225 230 235 240

Leu Gly Ile Asp Arg Tyr Phe Lys Lys Glu Ile Lys Glu Ser Leu Asp
245 250 255

Tyr Val Tyr Arg Tyr Trp Asp Ala Glu Arg Gly Val Gly Trp Ala Arg
260 265 270

Cys Asn Pro Ile Pro Asp Val Asp Asp Thr Ala Met Gly Leu Arg Ile
275 280 285

Leu Arg Leu His Gly Tyr Asn Val Ser Ser Asp Val Leu Glu Asn Phe
290 295 300

Arg Asp Glu Lys Gly Asp Phe Phe Cys Phe Ala Gly Gln Thr Gln Ile
305 310 315 320

Gly Val Thr Asp Asn Leu Asn Leu Tyr Arg Cys Ser Gln Val Cys Phe
325 330 335

Pro Gly Glu Lys Ile Met Glu Glu Ala Lys Thr Phe Thr Thr Asn His
340 345 350

Leu Gln Asn Ala Leu Ala Lys Asn Asn Ala Phe Asp Lys Trp Ala Val
355 360 365

Lys Lys Asp Leu Pro Gly Glu Val Glu Tyr Ala Ile Lys Tyr Pro Trp
370 375 380

His Arg Ser Met Pro Arg Leu Glu Ala Arg Ser Tyr Ile Glu Gln Phe
385 390 395 400

Gly Ser Asn Asp Val Trp Leu Gly Lys Thr Val Tyr Lys Met Leu Tyr
405 410 415

Val Ser Asn Glu Lys Tyr Leu Glu Leu Ala Lys Leu Asp Phe Asn Met
420 425 430

Val Gln Ala Leu His Gln Lys Glu Thr Gln His Ile Val Ser Trp Trp
435 440 445

Arg Glu Ser Gly Phe Asn Asp Leu Thr Phe Thr Arg Gln Arg Pro Val
450 455 460

Glu Met Tyr Phe Ser Val Ala Val Ser Met Phe Glu Pro Glu Phe Ala
465 470 475 480

Ala Cys Arg Ile Ala Tyr Ala Lys Thr Ser Cys Leu Ala Val Ile Leu
485 490 495

Asp Asp Leu Tyr Asp Thr His Gly Ser Leu Asp Asp Leu Lys Leu Phe
500 505 510

Ser Glu Ala Val Arg Arg Trp Asp Ile Ser Val Leu Asp Ser Val Arg
515 520 525

Asp Asn Gln Leu Lys Val Cys Phe Leu Gly Leu Tyr Asn Thr Val Asn
530 535 540

Gly Phe Gly Lys Asp Gly Leu Lys Glu Gln Gly Arg Asp Val Leu Gly
545 550 555 560

Tyr Leu Arg Lys Val Trp Glu Gly Leu Leu Ala Ser Tyr Thr Lys Glu
565 570 575

Ala Glu Trp Ser Ala Ala Lys Tyr Val Pro Thr Phe Asn Glu Tyr Val
580 585 590

Glu Asn Ala Lys Val Ser Ile Ala Leu Ala Thr Val Val Leu Asn Ser
595 600 605

Ile Phe Phe Thr Gly Glu Leu Leu Pro Asp Tyr Ile Leu Gln Gln Val
610 615 620

Asp Leu Arg Ser Lys Phe Leu His Leu Val Ser Leu Thr Gly Arg Leu
625 630 635 640

Ile Asn Asp Thr Lys Thr Tyr Gln Ala Glu Arg Asn Arg Gly Glu Leu
645 650 655

Val Ser Ser Val Gln Cys Tyr Met Arg Glu Asn Pro Glu Cys Thr Glu
660 665 670

Glu Glu Ala Leu Ser His Val Tyr Gly Ile Ile Asp Asn Ala Leu Lys
675 680 685

Glu Leu Asn Trp Glu Leu Ala Asn Pro Ala Ser Asn Ala Pro Leu Cys
690 695 700

Val Arg Arg Leu Leu Phe Asn Thr Ala Arg Val Met Gln Leu Phe Tyr
705 710 715 720

Met Tyr Arg Asp Gly Phe Gly Ile Ser Asp Lys Glu Met Lys Asp His
725 730 735

Val Ser Arg Thr Leu Phe Asp Pro Val Ala
740 745

<210> 40
<211> 53
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 40
tcgcccatgg actgaaacat ttttttttgtc gacttcacca atgtctggat tct 53

<210> 41
<211> 862
<212> PRT
<213> Taxus brevifolia

<400> 41

Met Ala Gln Leu Ser Phe Asn Ala Ala Leu Lys Met Asn Ala Leu Gly
1 5 10 15

Asn Lys Ala Ile His Asp Pro Thr Asn Cys Arg Ala Lys Ser Glu Arg
20 25 30

Gln Met Met Trp Val Cys Ser Arg Ser Gly Arg Thr Arg Val Lys Met
35 40 45

Ser Arg Gly Ser Gly Gly Pro Gly Pro Val Val Met Met Ser Ser Ser

50 55 60

Thr Gly Thr Ser Lys Val Val Ser Glu Thr Ser Ser Thr Ile Val Asp
65 70 75 80

Asp Ile Pro Arg Leu Ser Ala Asn Tyr His Gly Asp Leu Trp His His
85 90 95

Asn Val Ile Gln Thr Leu Glu Thr Pro Phe Arg Glu Ser Ser Thr Tyr
100 105 110

Gln Glu Arg Ala Asp Glu Leu Val Val Lys Ile Lys Asp Met Phe Asn
115 120 125

Ala Leu Gly Asp Gly Asp Ile Ser Pro Ser Ala Tyr Asp Thr Ala Trp
130 135 140

Val Ala Arg Leu Ala Thr Ile Ser Ser Asp Gly Ser Glu Lys Pro Arg
145 150 155 160

Phe Pro Gln Ala Leu Asn Trp Val Phe Asn Asn Gln Leu Gln Asp Gly
165 170 175

Ser Trp Gly Ile Glu Ser His Phe Ser Leu Cys Asp Arg Leu Leu Asn
180 185 190

Thr Thr Asn Ser Val Ile Ala Leu Ser Val Trp Lys Thr Gly His Ser
195 200 205

Gln Val Gln Gln Gly Ala Glu Phe Ile Ala Glu Asn Leu Arg Leu Leu
210 215 220

Asn Glu Glu Asp Glu Leu Ser Pro Asp Phe Gln Ile Ile Phe Pro Ala
225 230 235 240

Leu Leu Gln Lys Ala Lys Ala Leu Gly Ile Asn Leu Pro Tyr Asp Leu
245 250 255

Pro Phe Ile Lys Tyr Leu Ser Thr Thr Arg Glu Ala Arg Leu Thr Asp
260 265 270

Val Ser Ala Ala Ala Asp Asn Ile Pro Ala Asn Met Leu Asn Ala Leu
275 280 285

Glu Gly Leu Glu Glu Val Ile Asp Trp Asn Lys Ile Met Arg Phe Gln
290 295 300

Ser Lys Asp Gly Ser Phe Leu Ser Ser Pro Ala Ser Thr Ala Cys Val
305 310 315 320

Leu Met Asn Thr Gly Asp Glu Lys Cys Phe Thr Phe Leu Asn Asn Leu
325 330 335

Leu Asp Lys Phe Gly Gly Cys Val Pro Cys Met Tyr Ser Ile Asp Leu
340 345 350

Leu Glu Arg Leu Ser Leu Val Asp Asn Ile Glu His Leu Gly Ile Gly
355 360 365

Arg His Phe Lys Gln Glu Ile Lys Gly Ala Leu Asp Tyr Val Tyr Arg
370 375 380

His Trp Ser Glu Arg Gly Ile Gly Trp Gly Arg Asp Ser Leu Val Pro
385 390 395 400

Asp Leu Asn Thr Thr Ala Leu Gly Leu Arg Thr Leu Arg Met His Gly
405 410 415

Tyr Asn Val Ser Ser Asp Val Leu Asn Asn Phe Lys Asp Glu Asn Gly
420 425 430

Arg Phe Phe Ser Ser Ala Gly Gln Thr His Val Glu Leu Arg Ser Val
435 440 445

Val Asn Leu Phe Arg Ala Ser Asp Leu Ala Phe Pro Asp Glu Arg Ala
450 455 460

Met Asp Asp Ala Arg Lys Phe Ala Glu Pro Tyr Leu Arg Glu Ala Leu
465 470 475 480

Ala Thr Lys Ile Ser Thr Asn Thr Lys Leu Phe Lys Glu Ile Glu Tyr
485 490 495

Val Val Glu Tyr Pro Trp His Met Ser Ile Pro Arg Leu Glu Ala Arg
500 505 510

Ser Tyr Ile Asp Ser Tyr Asp Asp Asn Tyr Val Trp Gln Arg Lys Thr
515 520 525

Leu Tyr Arg Met Pro Ser Leu Ser Asn Ser Lys Cys Leu Glu Leu Ala
530 535 540

Lys Leu Asp Phe Asn Ile Val Gln Ser Leu His Gln Glu Glu Leu Lys
545 550 555 560

Leu Leu Thr Arg Trp Trp Lys Glu Ser Gly Met Ala Asp Ile Asn Phe
565 570 575

Thr Arg His Arg Val Ala Glu Val Tyr Phe Ser Ser Ala Thr Phe Glu
580 585 590

Pro Glu Tyr Ser Ala Thr Arg Ile Ala Phe Thr Lys Ile Gly Cys Leu
595 600 605

Gln Val Leu Phe Asp Asp Met Ala Asp Ile Phe Ala Thr Leu Asp Glu
610 615 620

Leu Lys Ser Phe Thr Glu Gly Val Lys Arg Trp Asp Thr Ser Leu Leu
625 630 635 640

His Glu Ile Pro Glu Cys Met Gln Thr Cys Phe Lys Val Trp Phe Lys
645 650 655

Leu Met Glu Glu Val Asn Asn Asp Val Val Lys Val Gln Gly Arg Asp
660 665 670

Met Leu Ala His Ile Arg Lys Pro Trp Glu Leu Tyr Phe Asn Cys Tyr
675 680 685

Val Gln Glu Arg Glu Trp Leu Glu Ala Gly Tyr Ile Pro Thr Phe Glu
690 695 700

Glu Tyr Leu Lys Thr Tyr Ala Ile Ser Val Gly Leu Gly Pro Cys Thr
705 710 715 720

Leu Gln Pro Ile Leu Leu Met Gly Glu Leu Val Lys Asp Asp Val Val
725 730 735

Glu Lys Val His Tyr Pro Ser Asn Met Phe Glu Leu Val Ser Leu Ser
740 745 750

Trp Arg Leu Thr Asn Asp Thr Lys Thr Tyr Gln Ala Glu Lys Ala Arg
755 760 765

Gly Gln Gln Ala Ser Gly Ile Ala Cys Tyr Met Lys Asp Asn Pro Gly
770 775 780

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Ala Thr Glu Glu Asp Ala Ile Lys His Ile Cys Arg Val Val Asp Arg
785                 790                 795                 800

Ala Leu Lys Glu Ala Ser Phe Glu Tyr Phe Lys Pro Ser Asn Asp Ile
                805                 810                 815

Pro Met Gly Cys Lys Ser Phe Ile Phe Asn Leu Arg Leu Cys Val Gln
            820                 825                 830

Ile Phe Tyr Lys Phe Ile Asp Gly Tyr Gly Ile Ala Asn Glu Glu Ile
        835                 840                 845

Lys Asp Tyr Ile Arg Lys Val Tyr Ile Asp Pro Ile Gln Val
    850                 855                 860
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